PMM

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

MARCH
1956

EUGENE B POWERS OWNER
UNIVERSITY MICROFILMS
313 N FIRST ST
ANN ARBOR MICH
P1A891

devoted exclusively to:

DIE CASTINGS

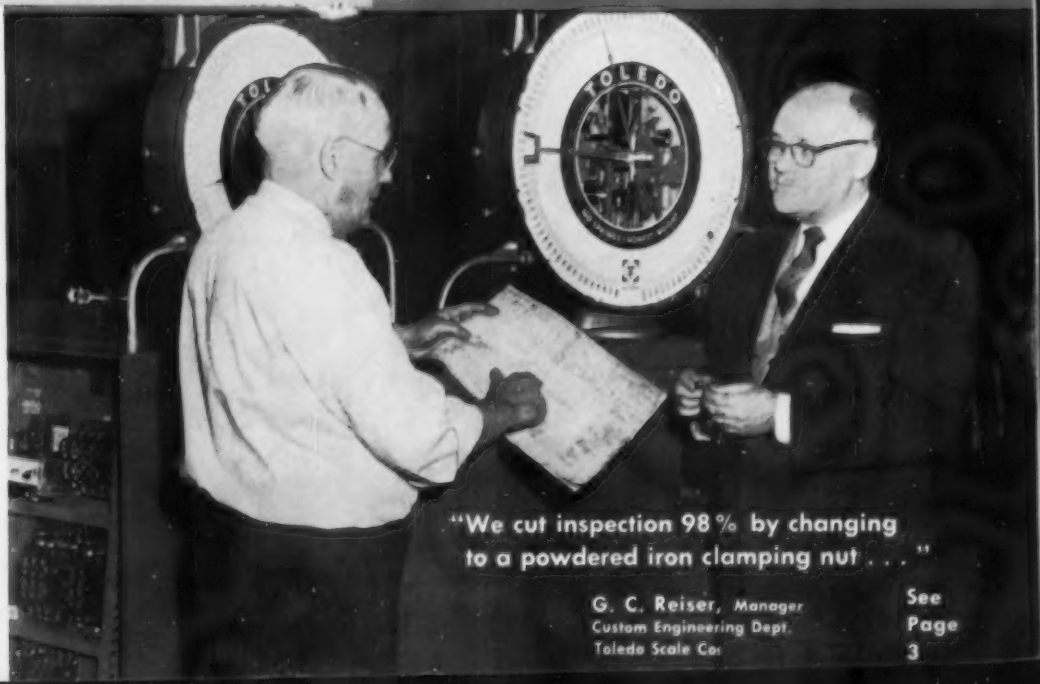
INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS



"We cut inspection 98% by changing to a powdered iron clamping nut . . ."

G. C. Reiser, Manager
Custom Engineering Dept.
Toledo Scale Co.

See Page 3

UNIFORM QUALITY • PROMPT SERVICE
PROMPT SERVICE • UNIFORM QUALITY
UNIFORM QUALITY • PROMPT SERVICE
PROMPT SERVICE • UNIFORM QUALITY
UNIFORM QUALITY • PROMPT SERVICE

ALUMINUM ALLOYS

- All alloys are quality controlled. Free from impurities and gas.
- Standard and special alloys to your specifications.
- Shipments are palletized for easier handling and storage.
- For TROUBLE-FREE production of QUALITY CASTINGS and DEPENDABLE SERVICE specify aluminum alloys from Aluminum Smelting & Refining Company.

Aluminum Smelting & Refining COMPANY, INC.

BEDFORD, OHIO
TELEPHONE : CLEVELAND MOntrose 2-3100

INDIANAPOLIS, INDIANA
215 CIRCLE TOWER • PHONE: MElrose 8-5541

DETROIT, MICHIGAN
P. O. BOX 4014 • PHONE: VErmont 7-9962

PROMPT SERVICE • UNIFORM QUALITY
UNIFORM QUALITY • PROMPT SERVICE
PROMPT SERVICE • UNIFORM QUALITY
UNIFORM QUALITY • PROMPT SERVICE
PROMPT SERVICE • UNIFORM QUALITY
UNIFORM QUALITY • PROMPT SERVICE
PROMPT SERVICE • UNIFORM QUALITY

ZAMAK

ZINC BASE DIE CASTING ALLOYS

- Uniform superior quality alloys produced under quality controlled methods.
- All alloys to your specifications.
- Palletized for fast efficient handling and storage.
- Be sure of TROUBLE-FREE production, QUALITY CASTINGS and DEPENDABLE SERVICE, call Certified

Certified Alloys COMPANY

BEDFORD, OHIO
TELEPHONE : CLEVELAND MOntrose 2-3100

INDIANAPOLIS, INDIANA
215 CIRCLE TOWER • PHONE: MElrose 8-5541

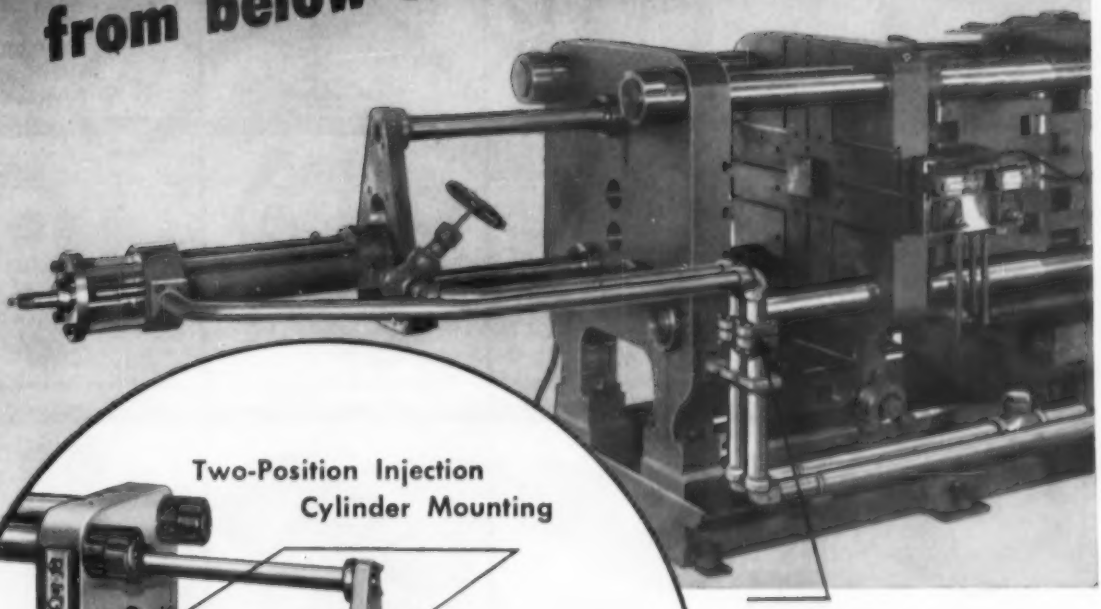
DETROIT, MICHIGAN
P. O. BOX 4014 • PHONE: VErmont 7-9962

LOS ANGELES PLANT
9323 BERMUDA ST., RIVERA, CALIF. • PHONE: OXford 9-9610

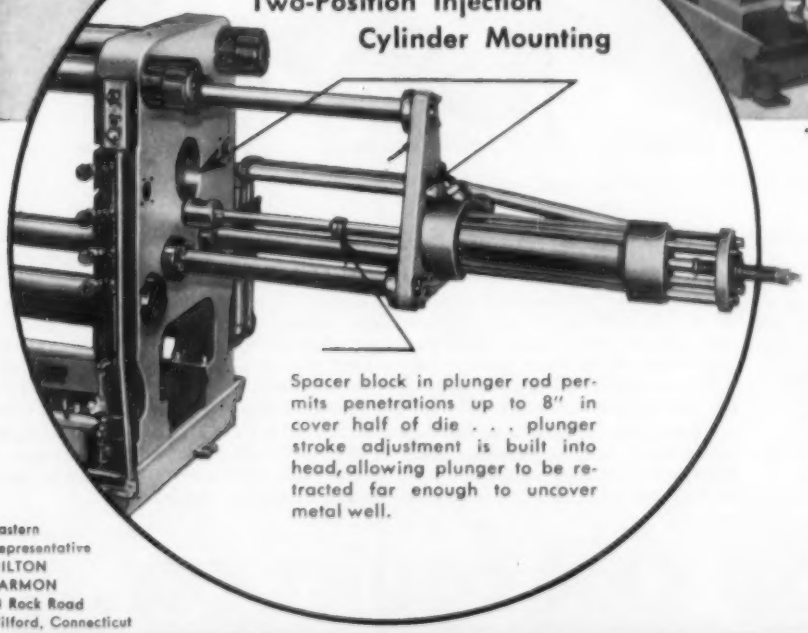
For more information circle No. 5 on the Reader Service Card

Another CAST-MASTER BONUS feature

FAST, EFFICIENT CHANGE-OVER from below center to center shot!



Two-Position Injection Cylinder Mounting



Spacer block in plunger rod permits penetrations up to 8" in cover half of die . . . plunger stroke adjustment is built into head, allowing plunger to be retracted far enough to uncover metal well.

When changing from below center to center shot, simple addition of extra section of pipe eliminates the use of hose or flexible tubing, thereby affording an extra measure of safety.

In modern production, time means money. That's why leading die casters praise the exclusive features shown here, which permit rapid change-over without sacrificing safety. To learn about other Cast-Master "bonus" features, send for the new, complete catalog giving illustrations and specifications on eight great new models.

SEND FOR CATALOG!

Eastern Representative
MILTON HARMON
18 Rock Road
Milford, Connecticut

CAST-MASTER Inc.

23901 AURORA ROAD
BEDFORD, OHIO

For more information circle No. 16 on the Reader Service Card

creative castings

Motor End Frames

Gyrol Fluid Coupling

Garbage Disposer Housing

Aircraft Piston

Torque Converter

Fuel Pump Body

Carbon Pile Regulator

Steel-Belted Piston

Alternator Housing

Diesel Permanent Mold Piston

Rocket Carrier Base

Air Connector

Outboard Propeller

Wing Actuator

For many years the foundry of Thompson's Light Metals Division quietly cast thousands and thousands of hard-to-make precision parts in light alloys of aluminum and magnesium for customers in the automotive and aircraft fields.

Then word got around in other industries that Thompson had the experience and facilities to cast light-weight, strong, heat-resisting alloy parts in permanent molds and high pressure dies—which eliminated the weight problems of ferrous counterparts. One by one manufacturers of widely different products came to Thompson for help and advice when they learned that the close tolerances achieved by Thompson cut machining and finishing costs.

Today, our capacity is channeled to top-rated jobs. We're building additional facilities as fast as possible and, in the meantime, Thompson services, as always, are at your command. Our entire staff of creative engineers is ready to help you plan new parts or re-design old ones for the future.

YOU CAN COUNT ON . . .

For a detailed description of the Thompson Light Metals Division operations, send for your free copy of "Creative Castings". "Steel Belted Pistons", detailing this Thompson development, is also available. Just write, on your company stationery, to Dept. PM-3, Light Metals Division, Thompson Products, Inc., 2269 Ashland Road, Cleveland 3, Ohio.

Thompson Products, Inc.

2269 Ashland Road • Cleveland 3, Ohio

LIGHT METALS DIVISION

For more information circle No. 66 on the Reader Service Card

COVER STORY

SMALL, WELDED clamping nut could not be held in proper angular relationship, requiring 100% inspection. Here, G. C. Reiser of Toledo Scale Co. examines an powdered iron unit that has cut inspection requirements to 2%. Story on page 35.

IRVING B. HEXTER
President

LESTER P. AURBACH
Executive Vice-President

EDWIN M. JOSEPH
Vice-President

STAFF

N. N. GOODMAN, JR.
General Manager

DAVID W. VEIT
Editor

PHILIP R. KALISCHER
Associate Editor

N. G. KISER
Circulation Director

DISTRICT OFFICES

NEW YORK
LEE HAAS, Mgr.
ARTHUR L. GOEBEL
60 E. 42nd St.—Room 803
New York 17, New York
Murray Hill 7-3420

CLEVELAND
ROBERT SIMMONS
1240 Ontario St.
Cleveland 13, Ohio
SUperior 1-9622

CHICAGO
CHARLES GEYER, Mgr.
KENNETH L. JONES
Suite 1613-1615
520 N. Michigan Ave.
Chicago 11, Illinois
WHitehall 3-1655-56-57

LOS ANGELES
ALAN CAZIER, Mgr.
Room 1003
3460 Wilshire Blvd.
Los Angeles 5, California
Dunkirk 9-9364

LONDON
JOHN A. LANKESTER
31 Palace St.
Westminster
London, S.W. 1, England

TOKYO, JAPAN
F. C. TAYLOR
American Trading Co. (Japan) Ltd.
No. 1 Shiba Park 7-Gochi
Minato-Ku, Tokyo

copyright 1956 by
The Industrial Publishing Group
Div. of Telenews Productions, Inc.
1240 Ontario St., Cleveland 13, Ohio

MARCH 1956 VOLUME 14 NUMBER 3

Precision Metal Molding

FEATURE ARTICLES

31 **WHO USES DIE CASTINGS? . . . BUSINESS MACHINES**

35 **ELIMINATED . . . ONE INSPECTION HEADACHE!** A powdered iron clamp solves a problem in angular alignment.

36 **QUALITY CONTROL OF INVESTMENT CASTINGS.** Part Three. Foundry considerations affecting the customer's quality specs.

38 **LIFE EXPECTANCY . . . . UP 500% OVER BRASS BAR.**

40 **ZINC AND ALUMINUM DIE CASTING ALLOYS,** Part Two, Review of current aluminum alloys in use.

43 **MAGNESIUM CAN BE CAST IN SHELL MOLDS,** French heels and a hi-fi pickup arm prove it.

44 **NEW PROPERTIES FOR YOUR PRODUCTS WITH BONDED BI-METAL.** New method of getting permanent bond between iron and aluminum.

47 **DRY-HEARTH, TWO-CHAMBER MELTING.** Report on a new type of furnace for die casting.

84 **LOW COST MOLDS AND DIES BY CASTING** using a recently introduced British process.

FINISHING SECTION

51 **HIGH SPEED NICKEL PLATING PROCESS** promises double output from existing equipment.

52 **ORGANIC FINISHES FOR DIE CASTINGS.** A working guide to selection of finishes and finishing equipment.

REGULAR DEPARTMENTS

8 Letters to the Editor
14 Names in the News
16 Data in Ads
19 Between the Lines
22 Casting About
26 Patents
63 Useful Literature
77 New Products
91 Industry News
93 Opportunities

SUBSCRIPTIONS: PRECISION METAL MOLDING is a controlled circulation magazine. Readers must qualify to receive it. Requests for subscriptions must include all of the following information: name, job title, company, company address, major products produced at that company address. Exceptions: certain technical libraries, consultants, associations, etc., may receive subscriptions at the rates shown below. The publisher reserves the right to reject any subscription application that does not conform to established circulation controls. Subscription rates: U.S. and possessions — $5, one year; $8, two years. Canada — $6 per year. Foreign — $7 per year. United Kingdom — £2.50 per year, payable in Sterling to London office. Single copies, when available: 1 to 10 — 50¢ each; 11 to 25 — 40¢ each; over 25 — 35¢ each.

Affiliated publications: APPLIED HYDRAULICS, FLOW, INDUSTRY & WELDING, MODERN OFFICE PROCEDURES, OCCUPATIONAL HAZARDS and COMMERCIAL REFRIGERATION AND AIR CONDITIONNG. Not responsible for unsolicited editorial material.

Published monthly. Accepted as a controlled circulation publication at St. Joseph, Michigan.
Please return Forms 3579 to 1240 Ontario St., Cleveland 13, Ohio

maximum process utilization

with MADISON-KIPP zinc and aluminum die castings

Die casting as a process has marked advantages in providing lightness, strength and stability in parts that can be cast to dimensions requiring a minimum of machining.

Seasoned skill, however, is involved in getting maximum process utilization as in the Madison-Kipp casting here illustrated, developed with the close cooperation of the user and the die designer.

Please clip this ad as a reminder to contact us when you have die casting requirements.

kipp

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U.S.A.

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

For more information circle No. 46 on the Reader Service Card

CRUCIBLE melting

Die Casting Aluminum with Cold Chamber Machines and Crucible Furnaces

For "cold chamber" die casting, melting or holding the metal in crucibles is preferred because of lower cost, better regulation and "crucible" quality metal.

Crucibles give minimum refractory maintenance even when chlorine is used for degassing. Iron contamination is completely eliminated.

Automatic temperature control is readily maintained.

Crucible furnaces can be heated with gas or oil fuel or electricity.

Crucible furnaces may be shut down over night or during non-working periods without any fuel or energy consumption or supervision.

Photo courtesy Republic Die Casting Co., St. Louis 7, Mo.

This 32-page, completely revised edition of Crucible Melting Handbook will be published soon. Watch for publication date.

First in FLEXIBILITY

CRUCIBLE MANUFACTURERS ASSOCIATION

20 W. 43rd STREET, NEW YORK 5, NEW YORK

CRUCIBLES FOR FLEXIBILITY

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR CRUCIBLE MELTING

VESUVIUS CRUCIBLE CO.
AMERICAN REFRACTORIES & CRUCIBLE CORP.
ELECTRO REFRACTORIES & ABRASIVES CORP.
JOSEPH DIXON CRUCIBLE CO.
ROSS-TACONY CRUCIBLE CO.
LAVA CRUCIBLE-REFRACTORIES CO.

For more information circle No. 19 on the Reader Service Card

Photo by Hedrich-Blessing

Prompt delivery

of **DIE CASTING DIE STEELS** from warehouse stocks

...every piece ultrasonically inspected

Crucible warehouses from coast to coast stock over 460 sizes of CSM 2 and NU DIE V die casting die steels—1″ to 40″ wide—¾″ to 15″ thick! And they're all available for *prompt* delivery.

What's more Crucible warehouses are equipped to cut die steels to the size you want. The hacksaw pictured above in one of Crucible's warehouses, for example, is the largest made. It can accurately cut die blocks up to 40″ x 25″.

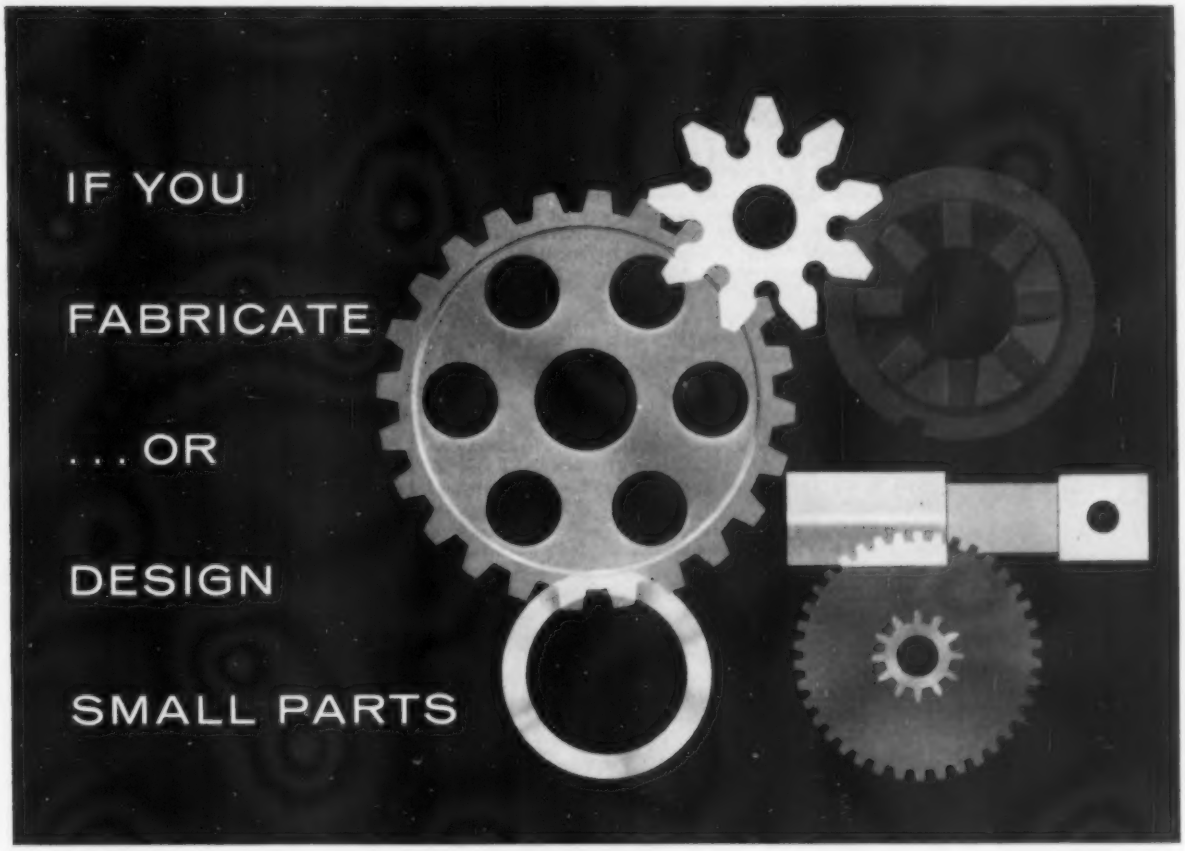
Huge stocks, plus versatile sawing and handling facilities, mean you get the steel you want *when you want it*. There's no need to wait for delivery from mill or forge shop when you can get *prompt* delivery from Crucible warehouse stock.

But there's more. Ultrasonic inspection of *every* piece of Crucible die casting die steel assures *sound die steel quality* every time. So next time you need die steels, look no further than your nearest Crucible warehouse. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information circle No. 20 on the Reader Service Card



Republic Iron Powder offers you new profit opportunities!

In many cases, you can make parts faster, more uniform and at less cost using Republic Iron Powder. Or, make complicated shapes which are difficult to produce economically by other means.

Republic Metallurgists can help you make the decision—help you determine iron powder's suitability to your parts. Or, they can suggest alternate methods or materials better suited to your particular needs.

Republic Iron Powder has good green and sintered strength to help you hit design targets and to simplify processing and handling. It is uniformly consistent, thanks to the qualities of base material and Republic's preparation processes. Particle size distribution and apparent density are carefully controlled. Republic's hydrogen reduction process has established acceptable limits on flow rate, hydrogen loss and chemical analysis.

Iron powder is coming up fast. According to the Metal Powder Association, approximately 30,000 tons were shipped in 1955—a phenomenal increase over 1954. Check the coupon for more information on using Republic Iron Powder in your parts production.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION,
3192 East 45th Street
Cleveland 27, Ohio

Please send more information on Republic Iron Powder

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

C-1836

For more information circle No. 62 on the Reader Service Card

More And More Manufacturers Are Installing
MARVEL SYNCLINAL FILTERS
AS STANDARD EQUIPMENT

Manufacturers of hydraulically actuated equipment and others with low pressure liquid circulating systems demand their equipment to perform consistently with all the productive efficiency they build into the machine that bears their name. Since these systems must be kept free of damaging particles, the selection of a filter is an important factor. Here are some of the outstanding reasons for the increasing preference for Marvel Synclinal Filters to do this all-important job!

SUMP TYPE (cutaway)

BECAUSE . . . Marvels are designed to give maximum ACTIVE filtering area rather than total filtering area. Only ACTIVE FILTERING AREA COUNTS!

BECAUSE . . . Marvels greater storage space for filtered out particles allows longer periods of "production" time at absolute minimum in maintenance cost and "down-time."

BECAUSE . . . Marvels can be disassembled, cleaned and reassembled by any workman in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connection.

BECAUSE . . . Marvels are protected and of sound construction to give long life and efficient filtration. THEY MEET J. I. C. STANDARDS.

BECAUSE . . . Marvels (Both Sump and Line Type) are available in individual capacities from 5 to 100 G.P.M. and choice of mesh sizes ranging from coarse 30 to very fine 200, they get a filter to fit their specific requirements.

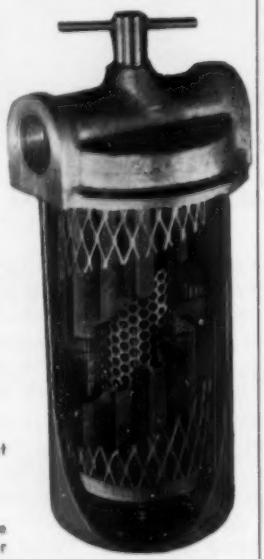
BECAUSE . . . Marvel not only delivers a top grade filter in both quality and performance, but delivers IMMEDIATELY—shipments are made the same day orders are received, if desired.

FACTS — NOT CLAIMS

Engineers decide on the basis of the record, on the basis of measurable facts rather than claims of the "campaign promise" variety. Here is a fact with meaning —

OVER 650 O. E. M.'s

Install MARVEL Synclinal FILTERS as Standard Equipment!



LINE TYPE (cutaway)

VISIT OUR EXHIBIT
BOOTH No. 1028
TOOL ENGINEERS
1956 Industrial Exposition and Convention
International Amphitheatre
Chicago, Illinois
MARCH 19 thru 23, 1956

For Dependable Protection on All Hydraulic and Other Low Pressure Systems Investigate MARVEL SYNCLINAL FILTERS

FILTERS FOR FIRE-RESISTANT HYDRAULIC FLUIDS

Marvel's most recent development is a filter for the efficient filtration of all types of fire-resistant hydraulic fluids.

WATER FILTERS

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

Catalogs containing complete data available on request

MARVEL ENGINEERING COMPANY
7227 N. Hamlin Ave., Chicago 45, Ill. PHONE: JUniper 8-6023

Without obligation, please send me complete data on Marvel Synclinal Filters, as indicated:—
- ☐ Catalog #107—For Hydraulic Oils, Coolants and Lubricants
- ☐ Catalog #301—For WATER
- ☐ Catalog #200—For Fire-resistant hydraulic fluids.

Name .....
Title .....
Company .....
Address .....
City .....
State .....

PMM-3

LETTERS TO THE EDITOR

HELP FOR DESIGNERS

I would very much appreciate receiving a copy of the fifth annual (Powder) Metallurgy Directory to be published in the April 1956 issue of Precision Metal Molding. We are, at present, putting our first two powdered metal parts into production and have several more designs on the boards. Any information that I can obtain will be of aid to our Engineering Department. R.B.F. (Purchasing Agent).

Judging from the advance interest that is being displayed concerning the fifth annual Powder Metallurgy Directory, which will be the big feature of the April issue of PMM, industry is really finding these compilations of manufacturing sources and technical information to be helpful. The editors of PMM hope so, and have added to the services of this magazine another industry-wide directory. That one is the annual Investment Casting Directory, to be published in June—Ed.

DESIGN POINTERS

We have just received our December issue of Precision Metal Molding and wish to congratulate you on your "18 Design Pointers" for Powdered Metal Parts.

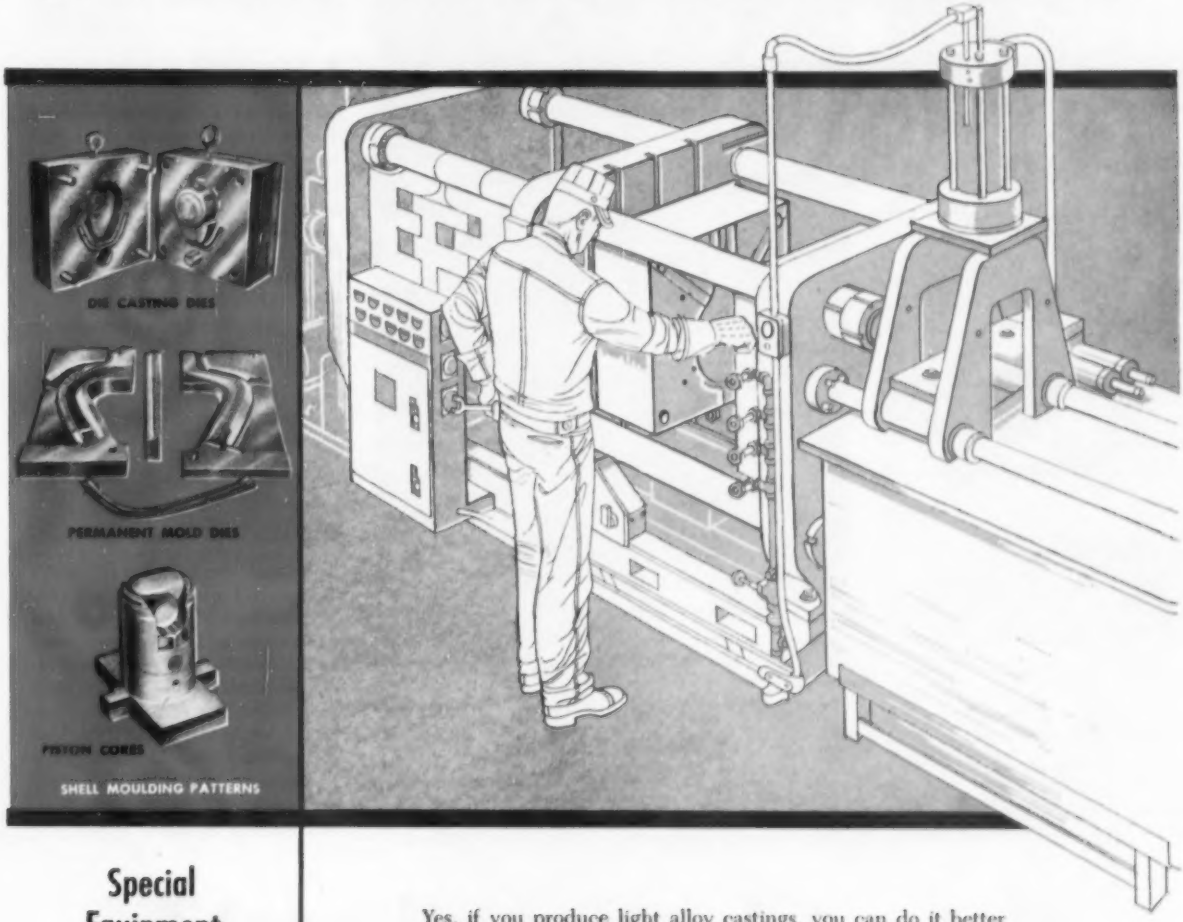
As we are manufacturers of Metal Sinterings, we feel these illustrations would be very useful to us and would assist the Design Engineers when considering applications for our products.

We would like, if possible, to include these in our catalogues and would be pleased to know if you would give us permission to make reprints.—J. R. (England).

Permission to reprint or use these guide-points that were put together to help designers, has been granted. Many others have requested tearsheets or reprints for their engineering departments. A similar feature concerning designing die castings will be a feature of PMM's April issue. Many leading die casters have al-

Continued on page 11

if you can do it with light alloys . . .
you can do it BETTER with PMD dies!



Special Equipment

- Permanent Mold Operating Devices
- D.C. Casting Units
- Billet Molds
- Coilers for Tubing
- Trim Dies

COMPLETE DESIGN AND ENGINEERING SERVICE AVAILABLE

Yes, if you produce light alloy castings, you can do it better with PMD dies! Longer service life, minimum starting problems, lower overall tooling costs—these are plus advantages you get from PMD!

One of America's largest independent producers of dies, molds, special machines and molding devices, Permanent Mold Die Company offers every facility to do the job right! Complete design-engineering service . . . skilled, experienced personnel . . . plus the specialized tools and equipment to meet every requirement.

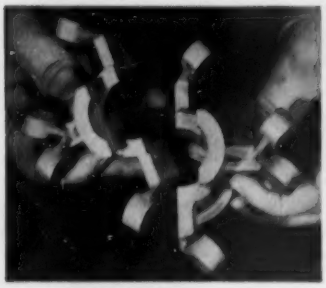
PMD dies and molds are *guaranteed* to perform to your specification! For the right solution to your tooling problems—call in a PMD specialist. Write or phone today!

PERMANENT MOLD DIE COMPANY, INC.
2273 East Nine Mile Road · Hazel Park, Michigan
Phone: SLocum 7-8100

WRITE TODAY FOR YOUR COPY OF THIS NEW PMD REFERENCE CATALOG!

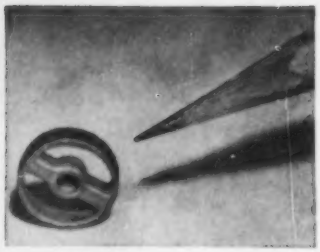
For more information circle No. 59 on the Reader Service Card

1. Cut costs up to 60%
When precision cast by Inco, these two trigger parts of a powder-actuated fastening tool cost the tool manufacturer *half* what they would have cost if machined from bar stock. *Instead of twenty machining operations he makes only two!*

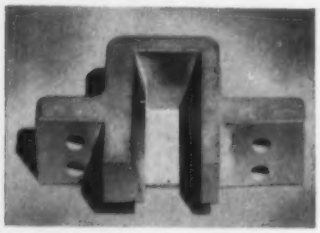


2. Wider design latitude Formerly, made in six parts, this stabilizer collar for a sonar device had to be assembled with screws. Inco precision casts it in *two parts*, simplifying and improving the design, cutting cost with fewer production and assembly steps.

3. Little or no machining required A milk-bottle capping machine has 6 of these stainless steel wedges. Once, each took 13 machining operations (more — counting rough and finish cuts). When precision cast by Inco, each needs only 9 machining operations — four of them light, finish cuts. *Net saving in machining time is 75%.*



4. Higher alloys at lower cost To protect color and flavor, the manufacturer of a liquor dispensing system wanted to make this collet head of Inconel* nickel-chromium alloy. Machined from bar stock, it needed 10 operations (and half the bar ended as scrap). Now, Inco precision casting makes the use of Inconel alloy practical, *cuts cost 30%.*



5. Longer life with harder alloys This latch for a commercial laundry machine must be strong and hard, resist galling and corrosion. "S" Monel* hard-grade nickel-copper cast alloy seemed the logical choice, but all the forging, broaching, soldering, drilling and facing ruled it out. However, Inco precision cast the latch so only finish machining is needed. Now, this alloy is practical to use.

Got a tricky small part?

...*Inco Precision Casting offers* 5 Big Advantages

Do you have a part which is 6 inches by 5 inches or smaller? Does it weigh under 3 pounds? Require starting tolerances as close as plus or minus .005 inch per linear inch? And need 5 or more fabrication steps? If the answer is *YES*, down the line, there's a good chance you can cut costs drastically, and achieve design advantages at the same time, by having it *precision investment cast* by Inco.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

Get This Helpful New Booklet
Trying to keep costs in line on some small part? Then write for new 16-page booklet, "Cast to Outlast." Contains many case histories detailing how others cut costs with Inco precision casting. There is a good chance this helpful data will suggest a practical way to cut your costs, too.

*Registered trademark of The International Nickel Company, Inc.

INCO TRADE MARK

Inco Castings *Precision • Sand • Centrifugal*

For more information circle No. 38 on the Reader Service Card

LETTERS
continued from page 8

ready submitted suggestions to help designers avoid the most common mistakes in detailing parts for die casting.—Ed.

INTERESTED IN VACUUM DIE CASTING

In your January 1956 issue of Precision Metal Molding, you have an article on vacuum die casting, in which we are very interested.

Would it be possible for you to send us some additional information (cost, cost of installation, etc.)? If you cannot supply this information, would you send us the address of the manufacturer so we can write for the details.—F. P. (Foreman, Die Cast Department.)

We do not have any data other than that published, but names of the manufacturer of the vacuum system, and of a die casting machine which incorporates it, have been forwarded.—Ed.

BOOK ON INVESTMENT CASTING

Is there a publication available either through the Investment Casting Institute or a technical press dealing with investment casting? If there is such a book as "The Investment Casting Handbook", where can we purchase a copy?—H. P. G.

The Investment Casting Institute is currently working on a design manual on investment casting, but it is not likely to be published before the end of the year. A comprehensive book on all phases of investment casting is "Investment Casting for Engineers" by Wood and Von Ludwig. It is published by Reinhold Publishing Corp.—Ed.

REPRINTS WANTED

I wish to congratulate you on the general quality of your magazine and in particular on two very fine articles in the January issue, specifically "What Goes Into Delivery Scheduling" and "Permanent Mold Casting . . . Process with a Future." In connection with the former article, I hope very much that it will be possible for you to make available some reprints to us. We would like very much to distribute them to present and prospective customers.—P. K. (President)

Impossible yesterday

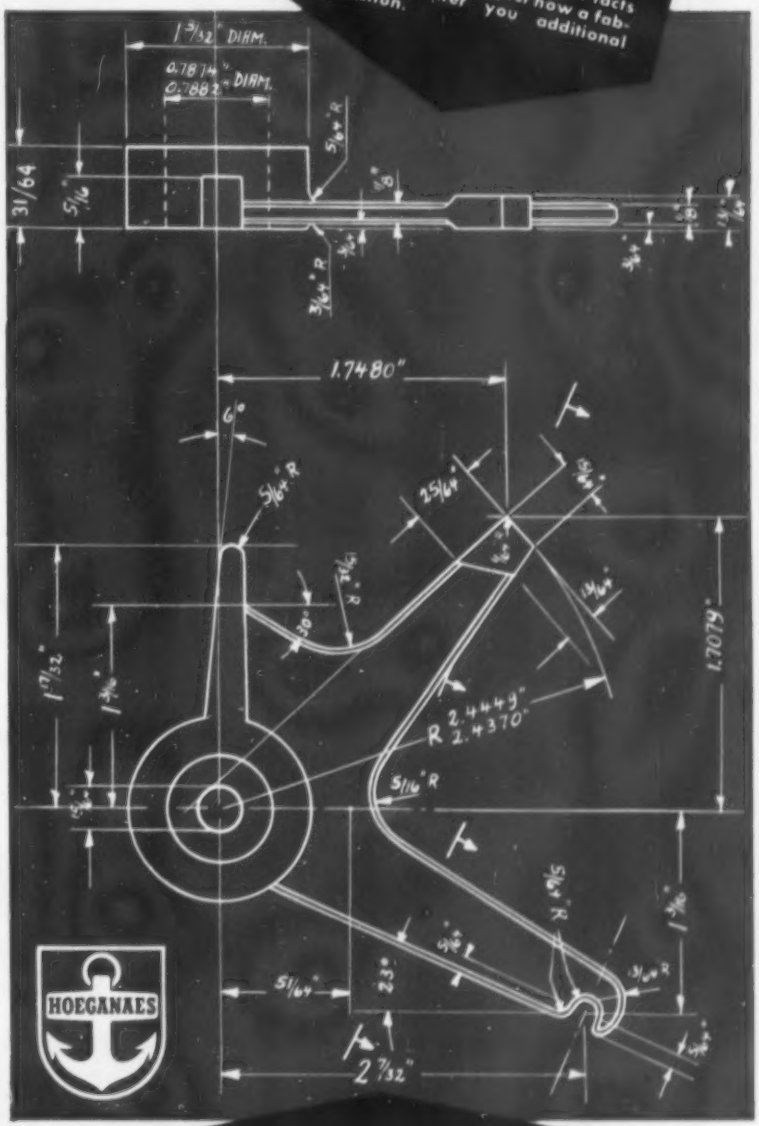
—practical today

Today, the powder metal process is achieving the impossibilities of yesterday. And to a full measure, improved Hoeganaes Sponge Iron Powders have contributed to this progress.

Study this drawing of an Automatic Stop. Note the complex projections and close tolerances. Densities are above 7.0 g/cc.

A logical conclusion would be that Powder Metallurgy and Hoeganaes Powders can help you to achieve similar practical results in your metal powder production program.

We would like to review further facts with you . . . and suggest how a fabricator can offer you additional cooperation.



HOEGANAES SPONGE IRON CORPORATION

Manufacturer of Sponge Iron Powder for powder metallurgy, welding, cutting and scarfing, and other industrial uses.

General Offices and Plant • RIVERTON, NEW JERSEY

For more information circle No. 34 on the Reader Service Card

SAMMY INGOT

$$$$ SAVES THE DAY FOR A WORRIED P. A.

IF I CAN'T FIGURE OUT SOME WAY TO KEEP THE COSTS DOWN ON THESE CASTINGS —— IT'S GOING TO BE MY NECK .....OR MY JOB !!!
PURCHASING AGENT
HERE'S YOUR SOLUTION .....
SAMUEL GREENFIELD COMPANY'S PROPER ALLOY SELECTION INSURES PROFITABLE FOUNDRY OPERATION ..... KEEPS PRICES COMPETITIVE !!!
BUT QUALITY CAN'T BE LACKING ON ANY OF OUR JOBS !
QUALITY INGOTS BEGIN WITH PROPERLY SELECTED SCRAP METAL !!! THATS WHY SAMUEL GREENFIELD CO. MAKES BETTER CASTINGS !!!
THAT SAVES THE DAY ... AND THE JOB, FOR ME... I'M CALLING SAMUEL GREENFIELD COMPANY FOR HIGHEST QUALITY BRASS AND ALUMINUM INGOTS ..... COMPETITIVELY PRICED !!!

"OUR INGOTS MAKE BETTER CASTINGS"

SAMUEL GREENFIELD
ALUMINUM ALLOYS

- Chemically Pure
- Rigidly Supervised and Tested
- Certified Chemical Analysis Furnished

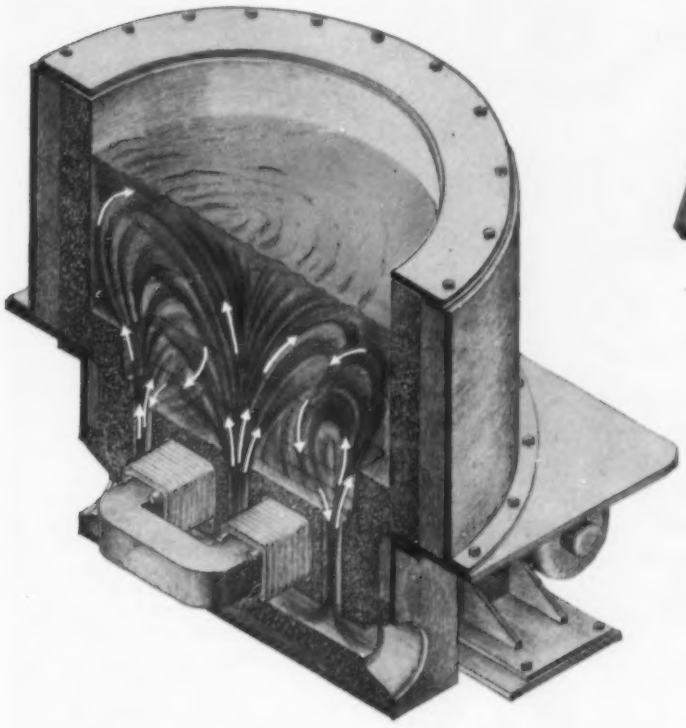
FREE FOUNDRY ENGINEERING CONSULTATION SERVICE

Over 120 years combined experience is yours at no obligation. Write or call . . .

SAMUEL GREENFIELD CO., INC.
HUmboldt 4050
31 Stone St. Buffalo 12, N. Y.

For more information circle No. 29 on the Reader Service Card

The Furnace that Stirs Itself!



ELECTROMAGNETIC PRESSURE CIRCULATES MOLTEN METAL

—In this 60 Cycle—

AJAX TAMA-WYATT *Induction Furnace*

Heat is generated only in the melting channels. Controlled stirring *(neither too much nor too little)* guarantees uniformity of metal temperature and alloy composition and also leads to efficient melting of light scrap. Tiresome puddling is eliminated. The metal is held entirely in an inert refractory lining. The atmosphere is cool and free from contaminating gases.

No Other Method Enables such Completely CONTROLLED MELTING

Today, AJAX builds a complete line of these time-tested furnaces in standard sizes up to 333 kW for the dependable melting of aluminum, brass, copper and zinc. Units for special applications are carefully engineered to specifications.

TWIN COIL INDUCTORS

Lead Non-Ferrous Melting

The sectional view above shows the twin coil stirring action of the 100 kW Ajax-Tama Wyatt 60 cycle induction furnace. Heat induced in the secondary channels below is conveyed throughout the melt by electromagnetic circulation as shown by the arrows. The 100 kW furnace shown here, is one of a family of twin coil furnaces available today for melting rates from 300 to 10,000 lbs. per hour.

For Further Information, Send For Bulletin R-43

AJAX ENGINEERING CORP., TRENTON 7, N. J.

AJAX = INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

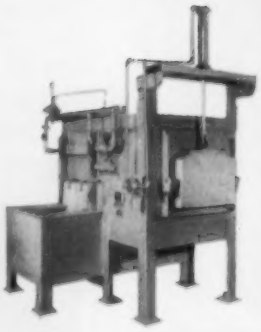
For more information circle No. 1 on the Reader Service Card

NEW ADVANCED METHOD FOR MELTING ALUMINUM

Arrangement of furnace dip-out permits close proximity to die cast machine, simplifies operation and increases production.

Newest Eclipse Furnace Joins 20 Year Veterans... Still On The Job!

• Madison-Kipp Corporation, Madison, Wis., has installed its thirty-fourth Eclipse aluminum melting furnace purchased over a 20-year period. This indicates that Eclipse furnaces offer the day-in, day-out reliable performance demanded by a large-volume maker of aluminum castings.



Dry hearth, side dip-out furnace

The newest furnaces are Eclipse Dry Hearth Soft Metal Melting Furnaces, fired by propane gas and arranged for side dip-out. Operating temperatures range from 1120 F to 1250 F with the average operating temperature at about 1180 F. Separate melting and holding chambers provide constant pouring temperatures and improved quality control. Cold metal is preheated and melted on the sloping hearth so only molten metal enters the holding chamber. This method eliminates gas pickup and oxide inclusions and results in higher quality metal.

Eclipse builds aluminum melting furnaces for a variety of production arrangements. They are available with end dip-out, side dip-out, or double side dip-out in capacities from 300 to 2000 lb of metal per hour.

Eclipse

For complete facts, write for new Bulletin No. C-90

ECLIPSE FUEL ENGINEERING CO., 1123 Buchanan St., Rockford, Ill.

Eclipse Fuel Engineering Co. of Canada, Ltd., Don Mills, Ontario

For more information circle No. 24 on the Reader Service Card

NAMES IN THE NEWS

William Howard Leggett was appointed sales engineer by *Acheson Colloids Co.* Mr. Leggett will head the Rochester, New York sales office of the company, covering upstate New York and replacing **Edwin A. Lampman** who retired in January, after serving 25 years with the company.

Joseph V. DiMasi has been appointed advertising manager of *Fansteel Metallurgical Corp.* Mr. DiMasi succeeds **Allan L. Percy,** who continues as director of public relations.

Dr. Robert T. Armstrong has been elected vice-president-technical director of *Celanese Corporation of America.*

The addition of **Josef F. Palme, Jr.** to the sales engineering staff of *Bart Laboratories Co., Inc.* was announced recently.

Crucible Steel Company of America has appointed **Bernard L. Jones** to the newly-created position of chief engineer for the company and **Tore Wallin** as assistant chief engineer.

Titan Metal Manufacturing Co. has announced the promotion of five executives to key positions. Named vice-president in charge of manufacturing is **Grey W. Tressler,** formerly works manager; **Marvin J. Rothrock** will be vice-president and director of purchases; **Ralph H. Lightner** becomes vice-president and sales manager; **H. Chapman Ward** will be vice-president and cost controller and **W. E. Dunnick** will be works manager.

The appointment of **Alfred L. Trumpler** as promotion manager has been announced by *Harper Electric Furnace Corp.*

The appointment of **Michael Gladstone** as sales manager has been announced by *Alloy Precision Castings Co.* Also announced is the appointment of **Edward J. Vargo** as chief metallurgist and **C. B. Beener** as chief engineer.

Edward Baruch was elected executive vice-president of *Heli-Coil Corp.* at a meeting of the company's Board of Directors.

William F. Christopher has been appointed manager-market development of *General Electric Company's Chemical Development Department.*

Beverly W. Duncan has been appointed head of research and development for *Misco Precision Casting Co.* In his new position, Mr. Duncan will supervise work of Misco's research group in development and improving new and existing casting techniques.

thanks to ACCUMET PRECISION INVESTMENT CASTINGS

This bolt-making machine transfer arm used to be machined from a forging of SAE 1045 steel. A grooved pin had to be machined and assembled in the forging, and many milling, broaching and drilling operations were needed to produce the finished part.

Then a Crucible ACCUMET® precision investment casting was tried, using heat-treated SAE 4140. Results? All machining except drilling and tapping two small holes was eliminated. Better functional design was achieved. A more rugged grade of steel was used. The manufacturer's machine tools were released for other jobs.

This is just one example of hundreds where ACCUMET precision investment castings have improved the design, function and performance of a component part – *with a reduction in cost.* It was possible because Crucible – the country's leading specialty steel producer – has established standards of quality and uniformity in its ACCUMET precision castings that are unsurpassed in the industry.

So look over the machining operations in your shop. Take an *extra* long look at the intricate products that are made in many costly, high-reject steps. Then let your Crucible representative show you how ACCUMET precision investment castings can help you lower costs and improve your products. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 12, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information circle No. 21 on the Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

1. INDUCTION MELTING furnaces for both ferrous and non-ferrous metals are discussed in bulletin No. R-43 from Ajax Engineering Corp.

2. INCREASE DIE CASTING production through the use of dry film lubricants. Reprint DC and bulletin 426-X10 from Acheson Colloids Co. discuss these materials.

7. DIE CASTING ALLOYS, their chemistry, metallurgy and as-cast physical and mechanical properties are given in a technical bulletin published by Apex Smelting Co.

8. MELTING FLUXES for use with zinc in the die casting industry are the subject of a technical bulletin that has been published by Atlantic Chemicals & Metals Co.

15. MELTING STOCK for the investment casting industry is the subject of a comprehensive technical catalog that has been issued by Cannon-Muskegon Corp.

16. DIE CASTING MACHINES that feature a fast change-over from below center to center shot are fully described in a catalog from Cast Master, Inc.

17. DIE CASTING MACHINES that have been specifically designed for fast cycling and extra long service life are covered in a new catalog on the model 400-N from Cleveland Automatic Machine Co.

18. TOOLS FOR POWDER METALLURGY can be built more economically when experts with the proper know-how do the job. Cleveland Tool & Die Co. has a new booklet that discusses these tools and the company's ability to make them.

23. METAL WORKING dies that utilize stock components are less costly and work longer and better. A complete catalog from Detroit Mold Engineering Co. lists the parts that are available from stock.

24. DRY HEARTH melting furnaces with one or two side dip-outs can be conveniently located adjacent to die casting machines for the most economical melting of metal. Bulletin No. C-80 from Eclipse Fuel Engineering Co. discusses these furnaces.

30. DIE CASTINGS, when properly designed and applied, will materially lower production costs by eliminating machine operations. A brochure from Hampden Brass & Aluminum Co. describes the company's complete facilities for design and production of die castings.

31. METAL MELTING FLUXES used with both aluminum and zinc produce cleaner metal and sounder castings. Two bulletins from Haviland Products Co. describe the fluxes for die castable metals.

33. INVESTMENT CASTINGS, their design, manufacture and application are covered in a 12 page booklet from Hitchiner Mfg. Co.

35. THE DESIGN & PRODUCTION of die castings are discussed in a booklet that has been issued by the Hoover Co.

36. DIE CASTING MACHINES that are said to be heavier, more rigid, have better locking and other advantages are described in bulletin 5400-A from The Hydraulic Press Mfg. Co.

38. CAST TO OUTLAST is the title of a booklet discussing the investment casting industry and the production of investment castings by The International Nickel Co.

39. MELTING FURNACES for investment casting, such as the new model ID, are discussed in literature from the Detroit Electric Furnace Div. of Kuhlman Electric Co.

40. DIE CASTING MACHINES to cover the complete range of sizes of castings that may be made are covered in the latest catalog from Kux Machine Co.

42. MELTING FURNACES should be tailored for the job they are to do. The Lindberg Engineering Co. bulletin 560 describes some of the many furnaces available for the die casting industry.

43. DESIGNING FOR DIE CASTING is the subject of a booklet that has been compiled by Litemetal Dicast.

47. CONVEYOR SYSTEMS for handling castings, trimmings, etc. are covered in the new May-Fran Engineering catalog.

50. ROTARY, CROSS SLIDE indexing tables are discussed and the specifications given in a catalog from Morrison Engineering Co.

59. CUT DIE MAKING COSTS by having dies and molds built by a custom fabricator with the best tooling and know-how. A booklet describing the facilities and experience of the Permanent Mold Die Co. in this work is available.

61. FOR CLEAN METAL, melt under a flux. One or more of the complete line of fluxes from Rossborough Supply Co. will clean your metal, refine the grain, degas or deoxidize the melt. Complete information on this line of fluxes is available.

62. IRON POWDER for powder metallurgical uses is discussed in literature that is available from Republic Steel Co. giving the properties of their new powder.

63. STAINLESS STEEL LADLES last longer and pour easier and cleaner. A listing of all available types and sizes in stock together with prices is available from Spincraft, Inc.

64. FURNACES AND AUXILIARY EQUIPMENT for every non-ferrous melting need are fully described in the all new Stroman Furnace & Engineering Co. Catalog.

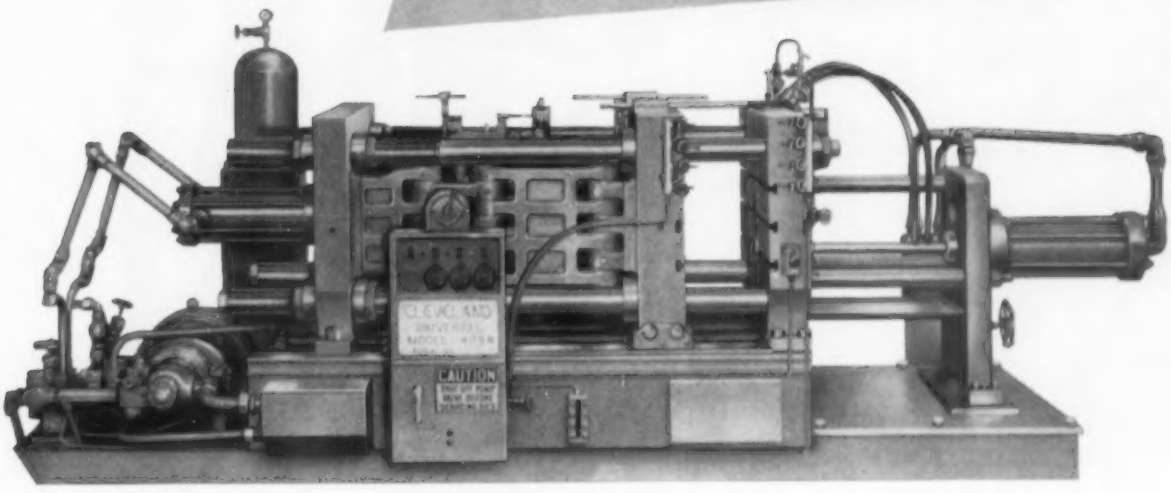
66. THE DESIGN AND APPLICATION of die castings is discussed in a booklet that has been prepared by the Light Metals Div. of Thompson Products Co.

67. BRASS DIE CASTINGS, their production and some suggested applications are covered in a 12 page booklet that has been published by Titan Metal Mfg. Co.

Continued on page 28

Meets *ALL* your requirements for *PROFITABLE* die casting!

Cleveland Model 400-N
shown with cold chamber end.



The CLEVELAND model 400-N
Hydraulic Universal Die Casting Machine

Here are the features of the Cleveland Model 400-N that will give you better castings, faster, at less cost:

- Massive, rigid construction throughout for dependable, economical performance.
- Powerful die locking pressure — 400 tons, strain gauge tested.
- Rapid, smooth die closing and opening for high production operation.
- High metal injection speeds to produce sound, dense, hardware finish castings.
- Safe, simple control—manual or automatic.
- Ample room for die mounting, for operation and maintenance.
- Universal construction — easily convertible for either hot or cold chamber operation.

To get the most from your die casting department —in speed of production and quality of castings —investigate the many advantages of the Model 400-N Cleveland. Let the Cleveland sales engineer in your area show you how the Model 400-N can improve your die casting production with money saved . . . or write direct for full details.

REMEMBER, CLEVELANDS CUT COSTS

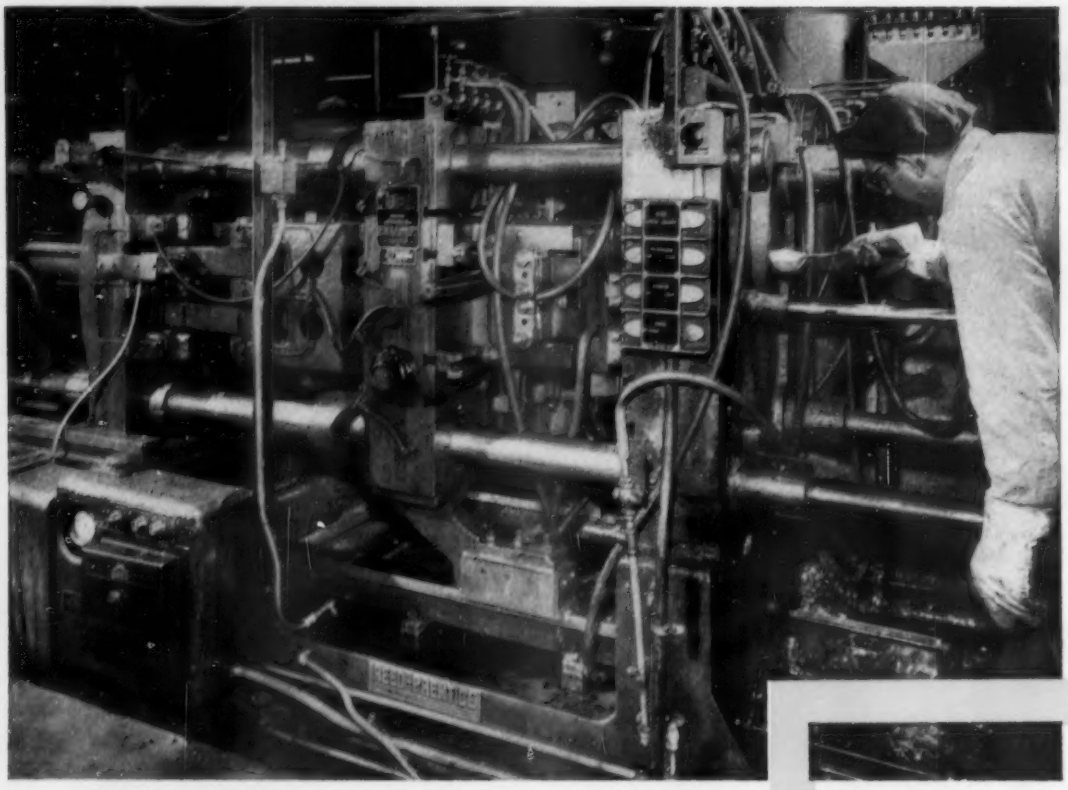
THE CLEVELAND AUTOMATIC MACHINE COMPANY

4952 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

For more information circle No. 17 on the Reader Service Card

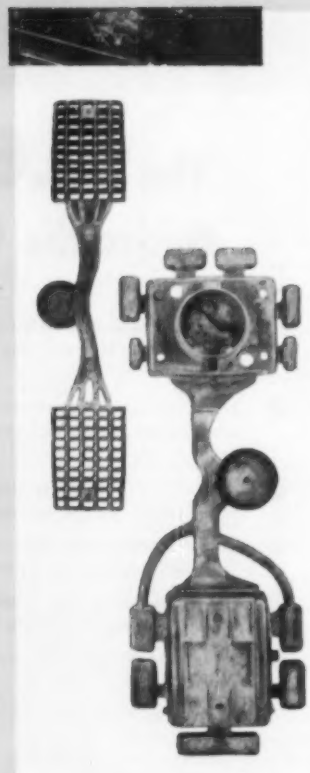


Operator ladles aluminum into Reed Prentice 2G cold chamber die casting machine at Dollin Corporation, where another 2G die caster with a "Hi-Speed Hi-Pressure" plunger attachment was recently installed.

"HI-SPEED, HI-PRESSURE" REED GIVES DOLLIN DENSE DIE CASTINGS

At Dollin Corporation's plant in Irvington, N. J., dense aluminum parts are produced on Reed-Prentice die casting machines equipped with the "Hi-Speed, Hi-Pressure" plunger. This unit increases plunger speed to 10,000 inches per minute, then adds a final high pressure squeeze. Coupled with the Reed-Prentice exclusive mechanical die locking feature that eliminates "pressure back-off", this high injection speed insures extra density in aluminum and magnesium castings.

These are two of the features you'll find engineered into Reed-Prentice die casting models for both aluminum and zinc. To get full information, contact your nearest Reed-Prentice Sales Engineer today.



REED-PRENTICE

Affiliate of PACKAGE MACHINERY COMPANY

WORCESTER 4, MASS.

BRANCH OFFICES: NEW YORK • CLEVELAND • DETROIT • CHICAGO • BUFFALO • KANSAS CITY • LOS ANGELES **REPRESENTATIVES:** HOUSTON — STEEL & MACHINE TOOL SALES CO. • MINNEAPOLIS — CHAS. W. STONE CO.

For more information circle No. 60 on the Reader Service Card

BETWEEN THE LINES

WHO USES DIE CASTINGS? There are few industries that don't, nowadays, but naturally, some use more than others. In fact, many of today's highest volume products are virtually "built of die castings". When the American Die Casting Institute published its tabulation showing who buys die castings, the editors of PMM decided to illustrate these statistics graphically. One of the major uses of die cast parts is to build business machines. On page 31, PMM shows some of these machines and where they use die castings.

IT TAKES MORE PAINT TO COVER A BARN than to spray a die casting, but it takes a lot more skill and special treatment to paint the castings. There are problems relating to adhesion, covering irregular shapes, selective coverage, special conditions of exposure, novelty finishes, choice of drying cycles, etc. To bring together a technical report on this subject, PMM this month devotes the major portion of its special Finishing Section to an analysis of the organic coating of die castings.

TOOLS AND DIES CAN BE CAST by a precision method that promises to reduce tooling costs. A study made by PMM a year ago indicated that a lot more metal parts would be made as die castings if only the tooling were less expensive. Now, a British process is being used to precision cast die cavities for die casting, as well as dies for forging, extrusion, permanent mold and plastics. The editors of PMM offer the first report on this new subject in any American publication. It appears on page 84.

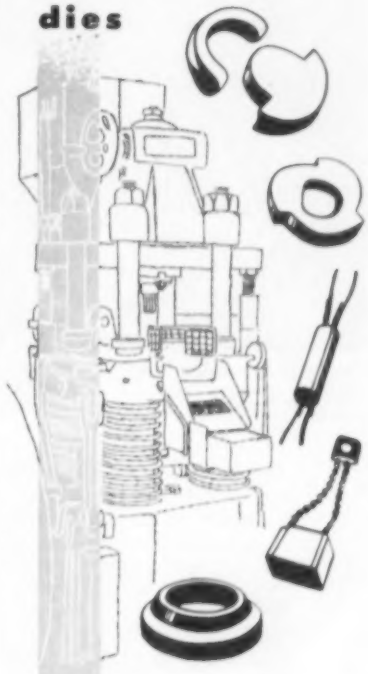
WHETHER YOU CALL IT VACUUM PLATING, or vacuum metallizing or vacuum coating, chances are you are finding more products finished by this low-cost process. It is very serviceable anywhere that an organic coating would be appropriate, and yet simulates in appearance the brightness of chrome plate. How one finishing plant is applying this new process for the coating of zinc die castings will be the subject of a detailed photo story, complete with process data, in the April issue of PMM.

WEIGHT OF ALUMINUM, STRENGTH OF IRON. You can combine these desirable properties by using a new process reported in PMM this month. Or it may be the heat conducting properties of aluminum, or its ability to be shaped into unusual or complex forms, that you want to couple with the rigidity, strength or other properties of iron. Details of the Al-Fin process for making a permanent bond between these two metals is treated beginning on page 44.

PRECISION

"Know-how"

in building high production compacting dies



Our experienced engineering skill is available to any firm working with the newest phase of metal-working — *powdered metal and ceramics* . . . particularly where Tungsten Carbide is used for absolute uniformity, precision tolerance stability and sound engineering design.

This new brochure is a "must" for engineering and production executives — write for your copy today.

SEND US YOUR PRINTS FOR ENGINEERED QUOTATIONS!

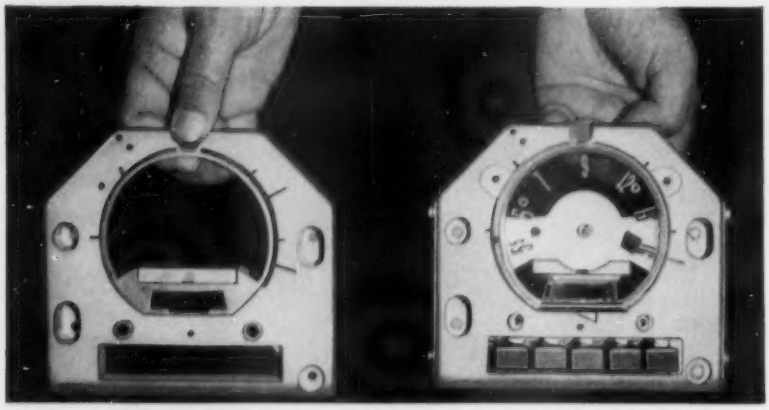
CLEVELAND TOOL AND DIE COMPANY

1643 EDDY ROAD • CLEVELAND 12, OHIO

Circle No. 18 on the Reader Service Card

DIE CASTING REPORT

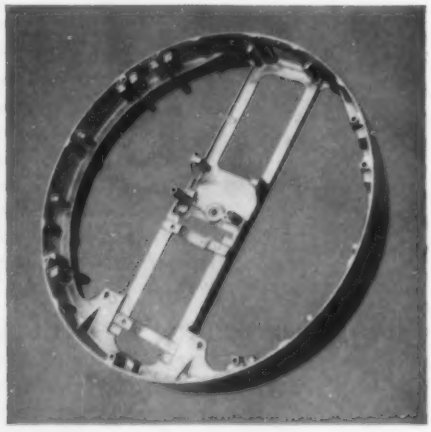
Half a million---or a few hundred ---designing parts for die casting can pay off big!

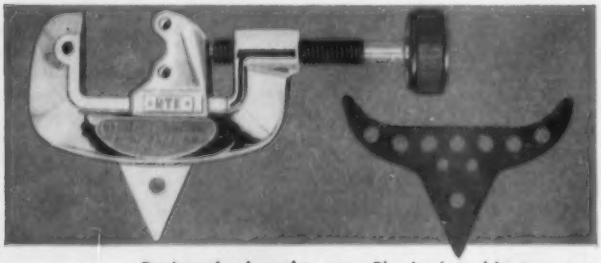


Radio Dial Housing: Production better than half a million. Features: thin walls and cast retaining grooves for close fit. Non-corrosive zinc alloy. Mounting bosses, normally welded on steel, are integral. Accurate cored recesses for tone control.

Aluminum dial support: Annual production in the low thousands, but die casting this unit saved weight, assembly time and machining. As an integral part of every scale, design changes are few; parts can be ordered from standing die, as needed.

Low production items, as well as those in the millions are often economical to die cast. What is the yardstick? There are many. Costs may be cut and production profits increased where intricate design and difficult contours may be impractical by other means. Die casting may save on machining; eliminate component parts and thus cut down assembly; provide more economical type of surface for plating. No matter what your production schedule may call for —investigate die casting before you decide. Let Precision engineers show you what can be done in aluminum, magnesium and zinc to lower your costs!



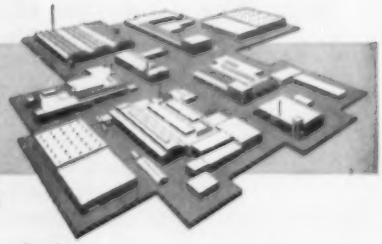


Resists shock and torque: Plumber's tool features perforated steel insert in zinc alloy frame. Production several thousand. Result: maximum strength, functional design at minimum cost. Chrome plating adds to wear resistance and sales appeal.

Look for these two symbols when you deal with a die casting supplier. They are your assurance of quality castings and high production standards. Precision is a pioneer member of the American Die Casting Institute and one of the founders of the Certified Zinc Plan.

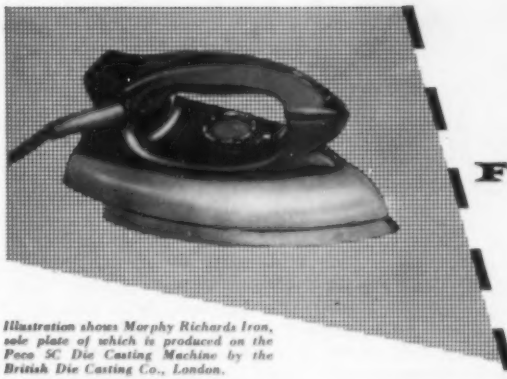
PRECISION CASTINGS CO., INC.

A SUBSIDIARY OF *Harrisburg Steel* CORPORATION



FAYETTEVILLE, N. Y.—SYRACUSE, N. Y.—CORTLAND, N. Y.—NEW YORK, N. Y.
CHICAGO, ILL.—CLEVELAND, OHIO—KALAMAZOO, MICH.

For more information circle No. 56 on the Reader Service Card



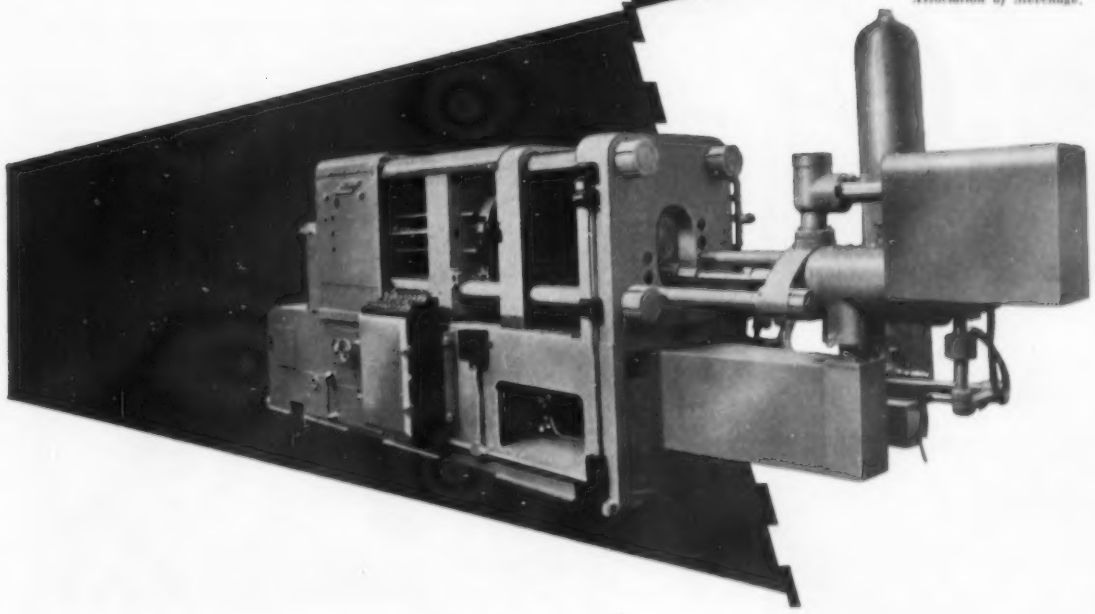
FROM ELECTRIC IRONS

Illustration shows Morphy Richards Iron, sole plate of which is produced on the Peco 5C Die Casting Machine by the British Die Casting Co., London.

TO SCHOOL DESKS

Above is an aluminum desk and chair, parts of which are produced on a Peco machine by the Educational Supply Association of Stevenage.

PECO DIE-CASTERS



PECO MACHINERY SALES (Westminster) LTD.

28 VICTORIA STREET, LONDON, S.W.1. Telephone: ABBey 1793/4/5
Telegrams: "PROFECTUS", SOWEST, LONDON. Cables: PROFECTUS, LONDON

Works: THE PROJECTILE AND ENGINEERING COMPANY LIMITED

PECO PRODUCTS

For more information circle No. 58 on the Reader Service Card

SERVING INDUSTRIAL AMERICA

QUALITY
SERVICE
DEPENDABILITY

WAREHOUSE DISTRIBUTORS OF
KAISER ALUMINUM
ALLOY FOUNDRY INGOT

ALLOYS & CHEMICALS
MANUFACTURING CO., INC.
4365 Bradley Road
Cleveland 9, Ohio
ONtario 1-8600

Circle No. 4 on the Reader Service Card

CASTING ABOUT

NEW DIE CASTINGS IN YOUR CAR may include a fuel injector in place of the familiar carburetor, according to new developments in the field of automotive engineering. American Bosch Arma Corp., of Springfield, Mass., has announced the development of a direct gasoline injection system for automobiles which is supposed to boost horsepower and give better acceleration and gas mileage. Fuel injection, which, it is understood, will be tried on some models of cars soon, will allow high compression engines to use lower grades of fuel.

LARGEST INDUSTRIAL ALUMINUM ORDER in the United States is reported to be the agreement just signed between Ford Motor Co. and Reynolds Metals Co. Under its terms, Reynolds will deliver to a new Ford aluminum foundry in Listerhill, Ala., approximately 64-million pounds of the lightweight metal per year for a period of ten years. The Ford news department comments that the foundry, which will spread out over 250,000 square feet and employ about 800 persons, will produce permanent mold and die castings to be used in automatic transmissions and engine parts. Construction of the plant is set to start this coming summer, with production to get underway by late in 1957. The new plant will take molten metal directly from a new large Reynolds reduction plant adjacent.

The upswing in use of aluminum, particularly in the form of die castings and permanent mold castings, over the past decade, has been noted, with some cars now carrying as much as 197 pounds of aluminum. Parts include pistons, motor housings, automatic transmissions, window frames and other components.

The new Reynolds reduction plant will bring that company's total capacity to more than 1,100,000,000 pounds per year.

EIGHT CORE PULLS in a complex die make possible a new type gasoline pump meter manufactured by A. O. Smith Corp. at its Los Angeles plant. Four hydraulically-pulled round cores form openings in each face, while four other cores produce the sides of the unit. The entire ejector half of the die is thus made up entirely of core pulls. A West Coast jobbing die caster produces this

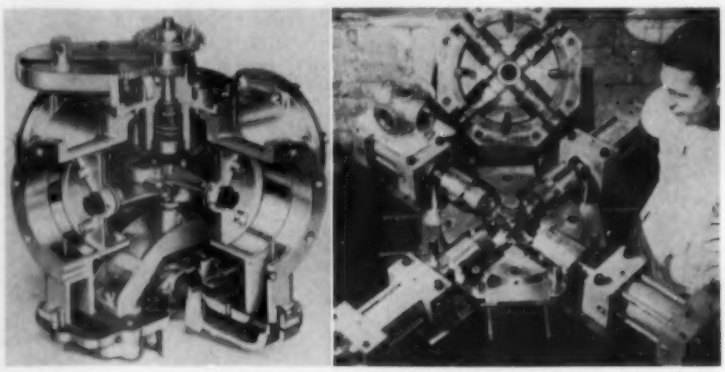


Photo: American Die Casting Institute

intricate, one-piece housing, sound enough to withstand normal operating pressure of 125 psi. In addition to the side cores already mentioned, the top and bottom holes, and the holes for mounting components and securing covers, are also cored, with the result that boring cylinder holes, finishing the base, and tapping a number of cored holes, are the only machining operations required.

The same gasoline pump is designed to include not only this aluminum die casting, but also die castings in zinc and bronze. Six important meter parts die cast in zinc include four pistons and two gears, while the meter's valve is die cast in manganese bronze because of its high abrasion resistance.

PLAIN FACTS ABOUT TWO METALS are contained in a pair of booklets published in the past few weeks by two organizations in the metal working industry. The American Zinc Institute has published a 16-page brochure containing a review of the zinc industry, 1955. Prepared by Ernest V. Gent, it offers a detailed analysis of supply and usage. It is available free from the American Zinc Institute, 60 E. 42 St., New York City. On the other hand, the new booklet published by the American Electroplaters' Society is entitled, "Nickel Story" and contains not only a statistical study of the world and domestic nickel situation, also statements by several men in the field. This piece can be bought for 50c from the AES at 445 Broad St. Newark, N. J.

BUILD AUTOMATIC TRANSMISSIONS IN CANADA? Yes, says T. J. Ault, president of Long Manufacturing Div., Borg-Warner Corp., who believes that the manufacture of automatic transmissions might represent an annual industrial volume of $30,000,000 to $45,000,000 in Canada. At the present time, he pointed out to a meeting of the Die Casters branch of the Automotive and Aircraft Parts Manufacturers' Association in Canada, all such transmissions must be imported into Canada.

Die cast parts, comprising the valve body assembly, are the "brains of the transmission," he said in analyzing the design of the six types of automatic transmissions made in the U.S. The trend, he commented, is to use more and more die cast parts as design improvements are made.

A tariff regulation designed to permit automatic transmissions to enter Canada free of duty was designed to give time to determine the public reaction to the automatic gear shifting mechanism. In 1955, 25 to 30% of cars built in Canada were equipped with automatics, and this is expected to increase to 40-50% in 1956, he said.

As a result, Mr. Ault suggested, Canadian authorities should reexamine their policy on duty-free transmissions with the objective of encouraging Canadian plants to manufacture this type of equipment.

MAGNESIUM SHIPMENTS for 1955 show an increase in volume of both die castings and permanent mold castings, along with a decrease in shipments of sand castings. Overall picture shows a total increase of 9%, according to The Magnesium Association, with die casting shipments rising 22.5% and permanent mold up 32%. In all, 13,944 short tons of magnesium castings were shipped in 1955.

Titan
brass pressure die castings

- cut fabrication costs
- simplify secondary machining
- are made in complex shapes
- have consistent uniformity
- allow large weight savings
- increase production rates

A pioneer in manufacture of brass pressure die castings, Titan can supply these parts to meet your requirements. Little or no secondary machining operation is needed on Titan pressure die castings. Intricate shapes and deep cored holes are readily produced, are consistently uniform. To save weight, wall sections as thin as .070 inches are generally feasible; but 1/32 inch section is possible if not too large in area. Machine scrap is reduced, and your fabrication costs cut. Moreover, the better surface finish, sharper outlines, greater accuracy, higher strength, and finer grain structure of Titan brass pressure die castings make them unquestionably superior to sand and other types of castings.

Anyone of these versatile advantages may be reason enough to specify Titan brass pressure die castings as components in your finished product. Find out what Titan can do for you.

Send for 12-page booklet on Titan brass pressure die castings

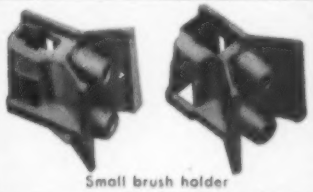
Titan®

METAL MANUFACTURING CO.
BELLEFONTE, PA.
Offices and Agencies in Principal Cities
RODS • FORGINGS • DIE CASTINGS
WELDING RODS • WIRE

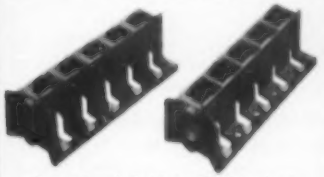
VISUAL PROOF

These photos demonstrate how little secondary machining is required on typical Titan pressure die castings. In each case a part as cast and trimmed only, and the same part machined are shown.

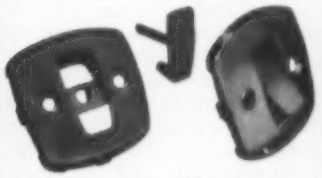
Flywheel for garbage disposal unit



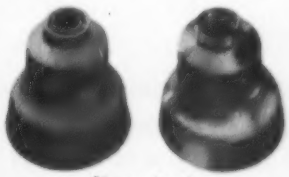
Small brush holder



Large brush holder with broached holes held to close tolerance



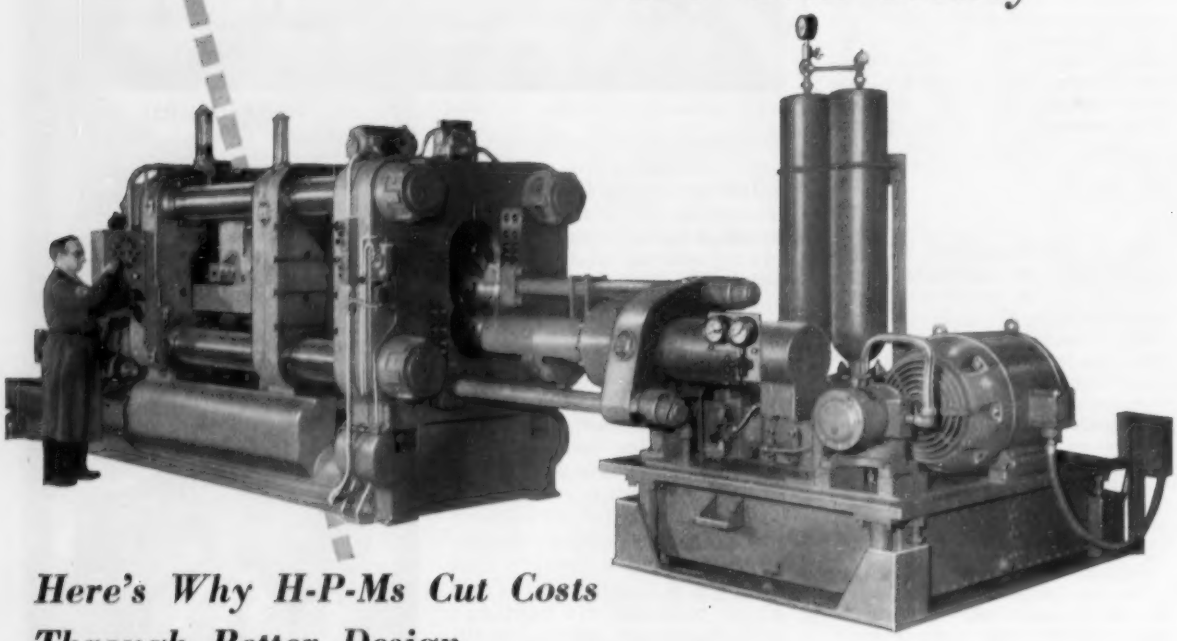
Overflow plate and trip handle



Shower head

IF YOU DIE CAST . . .

H-P-Ms Give You More For Your Money



Here's Why H-P-Ms Cut Costs Through Better Design

H-P-M die casting machines are the answer to many of today's die casting problems . . . production output to meet any job requirement . . . cleaner castings . . . negligible flash . . . parts produced to accurate dimensional tolerances with improved quality and density. H-P-M's new design, mechanical link wedge clamp and new injection end, results in a new approach to die casting techniques. Here's why H-P-Ms are the best buy:

1. MORE "BEEF"—Heavier platens . . . more die support, less deflection. Larger rods . . . reduced flash, less trimming . . . more casting dimensional control . . . less die trouble.
2. MORE PRESS WEIGHT—Compare price per pound . . . you'll have difficulty finding an equal. In addition . . . H-P-M's many new design features.
3. MORE HORSEPOWER—Clamps to the rated tonnage . . . more pressure cycles per hour . . . higher injection speeds and pressures . . . positive and instantaneous injection follow through.
4. MORE SPEED IN DIE SET-UP—Single central screw adjustment changes daylight and controls tonnage . . . no tie rod nut adjustment.
5. MORE PRESS FLEXIBILITY—No die too complicated or sequence too elaborate. Infinitely adjustable . . . complete control of action, both clamp and injection ends . . . speed and tonnage assured when needed.
6. MORE SAVINGS IN MAINTENANCE—Self-contained clamp and injection ends . . . compact hydraulic power units . . . manifolded high pressure hydraulics . . . automatic lubrication . . . simplicity of mechanical link wedge design.

Write for Bulletin 5400-A, today

DIE CASTING DIVISION
THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.

HPM

For more information circle No. 36 on the Reader Service Card

heat regulator body shown about 3 times actual size

a YALE powdered metal part... the millionth will be as accurate as the first

A large part, as powdered metal parts go. Difficult to produce in quantity to the accurate tolerances necessary. Helps run one of America's best-known automobiles.

The auto manufacturer chose YALE to produce this part only after the most careful consideration of what we had to offer.

He knew that powdered metal parts cost far less than cast and machined parts, but that wasn't enough. It was vital that this savings in cost be accomplished with no sacrifice in quality. So he chose YALE Powdermet* parts.

He had to be sure the millionth part would be as accurate as the first. That we could give him delivery on schedule. Imaginative engineering. Large-scale production facilities. More reasons why he chose YALE. And then there was the most important fact, the one he'd known from the very beginning...

He knew he could depend on YALE. And he knows that you can, too. We're as close as your telephone whenever you'd like to talk about it.

*REG. TRADE MARK

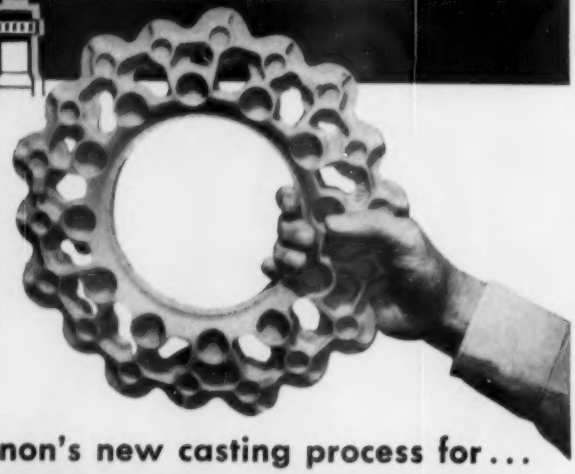
powdered metal parts

YALE & TOWNE

THE YALE & TOWNE MANUFACTURING COMPANY, POWDERED METAL PRODUCTS DIVISION, 9335 BELMONT AVENUE, FRANKLIN PARK, ILLINOIS

For more information circle No. 69 on the Reader Service Card

CERAMICAST*



Typical of the intricate design and thin metal sections possible with the CERAMICAST process is this backing plate for a jet aircraft brake.

Lebanon's new casting process for...

CLOSE TOLERANCE STEEL CASTINGS AT LOW COST

FOR QUALITY

- **TOLERANCES as close as** ±.003" to .005" per inch.
- **INTRICATE SHAPES:** Ideal for castings of complex design.
- **THIN SECTIONS:** Metal sections to 3/32 of an inch. Knife-like edges to .030" or less.
- **SMOOTH SURFACES:** Variations held to 125 micro-inches or better.

FOR PRICE

- **LOWER PRODUCTION COSTS:** Jobbing wood or metal patterns can be used. Design changes quick and inexpensive.
- **REDUCED MACHINING COSTS:** Smooth, accurate castings greatly reduce or eliminate machining.
- **SHORT LEAD TIME:** Because of easily constructed pattern equipment and relatively simple production process.

ADAPTABLE TO MANY CASTING SIZES AND ALLOYS—casting weights up to one hundred pounds or more. Carbon steel, conventional low alloys, stainless steels and the superalloys.

SEND US YOUR BLUEPRINTS. Our sales engineering department will show you how the revolutionary Lebanon CERAMICAST Process can be adapted to your project design.

*produced under licensing agreement with Shaw Processes, Ltd., London, England.

CIRCLE L ®

LEBANON STEEL FOUNDRY

168 LEHMAN STREET LEBANON, PENNSYLVANIA

CARBON, LOW ALLOY AND STAINLESS STEEL CASTINGS

For more information circle No. 44 on the Reader Service Card

A review of recent U.S. PATENTS

Copies of all patents reviewed can be secured from U. S. Patent Office, Dept. of Commerce Washington, D. C. for 25¢ each.

A METHOD FOR ATOMIZING aluminum in which the molten aluminum, held at a temperature of between 675C and 800C is allowed to pour through an orifice in a steady stream onto a rapidly revolving, carbon faced, heated disc. The distance of fall (i.e. the distance between the bottom of the orifice and the plate surface) is between 1½" and 14". During atomization the rotating disc is maintained at a temperature above the melting point of the metal and revolves in a neutral atmosphere that is maintained at a temperature below the melting point of the metal.

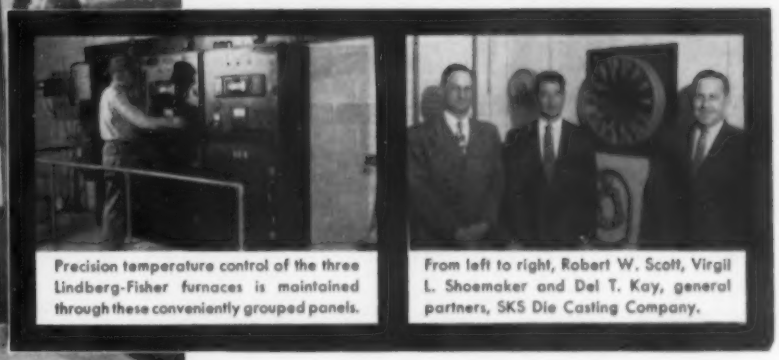
(Patent No. 2,728,107—Atomizing Aluminum—Gordon F. Hershey—assigned to The Dow Chemical Co.—issued Dec. 27, 1955—4 claims.)

EQUIPMENT FOR CEMENTING the halves of shell molds together which consists of two plates, at least one of which has a plurality of compression springs mounted on it. The springs are so arranged that they bear on non-cavity areas of the shell mold only. The entire unit is designed to be used in any power press available which has supporting members large enough to accommodate the plates of the cementing fixture.

(Patent No. 2,728,122—Method and Apparatus for Shell Moulding—Thomas J. McLeer—assigned to Cooper Alloy Corp.—Issued Dec. 27, 1955—9 claims.)

A METHOD OF MAKING BORON CARBIDE articles. The boron carbide powder is mixed with water to form a plastic mass which is molded in a die of suitable shape. The resulting piece, without drying, is heated in air or other oxygen bearing atmosphere to a temperature of 600C to 1000C to form a superficial layer of boron oxide and then to melt this oxide so as to cause the particles to be cemented together.

(Patent No. 2,728,128—Method of Producing Boron Carbide Articles and Product Thereof—Charles Sheer and Jay Tittman— assigned to the United States of America, Atomic Energy Commission—Issued Dec. 27, 1955—10 claims.)



Precision temperature control of the three Lindberg-Fisher furnaces is maintained through these conveniently grouped panels.

From left to right, Robert W. Scott, Virgil L. Shoemaker and Del T. Kay, general partners, SKS Die Casting Company.

"Outstanding Improvement"

IN CASTING METHODS WITH LINDBERG-FISHER INDUCTION FURNACES

● SKS Die Casting Company, Berkeley, California, is engaged in critical close dimensional work in casting fuel cell fittings for aircraft. To achieve consistent results extremely close control of metal temperature is essential.

Mr. Del T. Kay, SKS general partner, says: "We had no previous experience in induction melting and holding and sought the best advice we could find. As a result, we have installed three Lindberg-Fisher two-chamber Induction Melting Furnaces. These fulfilled our requirements completely and represented an *outstanding improvement* over our previous methods."

Like SKS, you will also find that Lindberg-Fisher Induction Melting and Holding Furnaces provide these advantages: cleaner molten metal, continuous production, cooler operation and minimum maintenance. Ask us to recommend the proper type of furnace for your particular needs or write for our Bulletin 560.

LINDBERG-FISHER MELTING FURNACES

LINDBERG ENGINEERING COMPANY, 2463 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

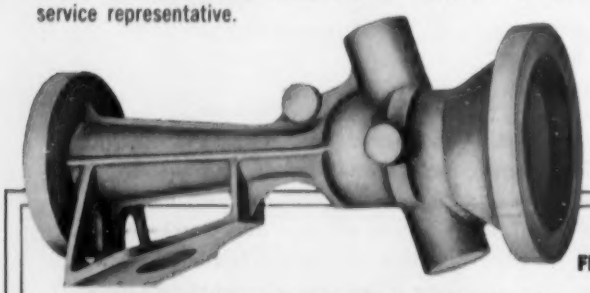
For more information circle No. 42 on the Reader Service Card

DESIGN PARTS FOR THE SHAPE YOU WANT—Investment Casting can produce the most intricately shaped parts with little or no secondary machining required.

CHOOSE THE ALLOY YOU WANT—Investment Castings are produced in any of the ferrous or non-ferrous alloys, including magnesium.

USE THE PROCESS WISELY—Give full consideration to weight, dimensions, tolerances and surface finishes when designing for Investment Casting. Take full advantage of the economies inherent in the process.

CONSULT ARWOOD ENGINEERS—Arwood casting engineers will gladly consult with you on your design and production problems, helping you translate them into finished products. Write for the name of your nearest ARWOOD sales and service representative.



DESIGN FLEXIBILITY

Parts similar to this stainless steel valve body for an air flow controller often require several changes before design is finalized. Due to the relatively low cost of dies and die changes, the investment casting process has proven an inexpensive and flexible method.

ARWOOD

ARWOOD PRECISION CASTING CORP.

71 Washington Street, Brooklyn 1, New York

Plants: Brooklyn, N. Y. • Groton, Conn • Tilton, N. H. • Los Angeles, Calif.

"PIONEERS IN INVESTMENT CASTING"

For more information circle No. 11 on the Reader Service Card

DATA IN ADS
continued from page 16

10. PLUNGER RINGS with exceptionally long life for use in die casting machines are the subject of literature from Auto Diesel Piston Ring Co.

12. 1100 CASTING CYCLES per hour are reported for a new die casting machine described in literature from American Die Casting Machine Co.

19. MELTING HANDBOOK will soon be available from Crucible Manufacturers Association. The 32-page publication will be a valuable reference guide.

32. DATA BOOK on zinc alloys for die casting is offered in a pocket-sized edition by Henning Bros. & Smith.

52. LOCATE YOUR PLANT properly, if you are thinking of moving, according to a booklet from the North Carolina Dept. of Conservation and Development, titled, "Industrial Location Factors."

53. PLASTER MOLD CASTINGS are covered in a brochure offered by Ohio Precision Casting Co., including design data and case studies.

57. HELP IN CHOOSING plunger rings for die casting machines is offered by Precision Piston Ring Co.

60. DIE CASTING MACHINES with positive mechanical locking action are described in a complete catalog offered by Reed-Prentice.

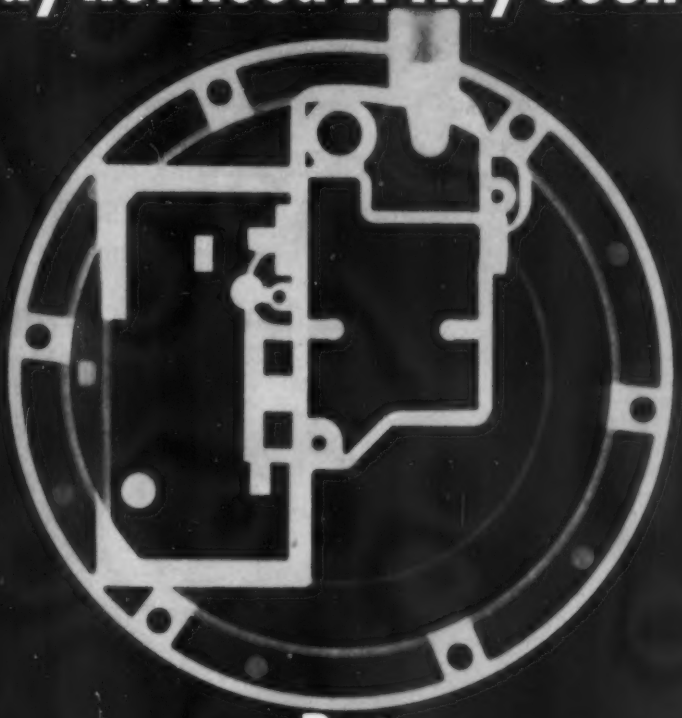
74. PAINT SPRAY MASKS and related machines and equipment, are the subject of several pieces of literature available from Conforming Matrix Corp.

85. TAPPING HEADS having an exclusive type of tap holder that permits perfect tapping action close to walls and shoulders, are described in a brochure from Procunier.

90. DEBURRING & SURFACE FINISHING are among the uses for an abrasive blasting machine described in Pangborn's Bulletin 1402.

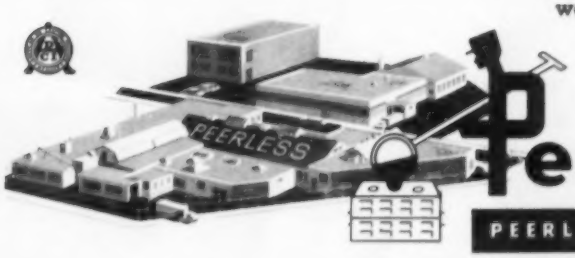
Continued on page 75

You may not need X-Ray Soundness...



But it will pay you to investigate the advantages offered by a supplier who can produce them. This gas-meter valve housing, for example, must meet rigid physical specifications.

Not every die casting calls for the high degree of soundness exhibited by this x-ray photo. But, whatever your needs in aluminum castings, it's to your advantage to know a supplier to whom quality comes first: a modern plant equipped with the finest equipment, staffed with experienced engineers, technicians and die makers. Peerless is that kind of supplier. Let us show you how we can fill your aluminum casting needs better.



Peerless

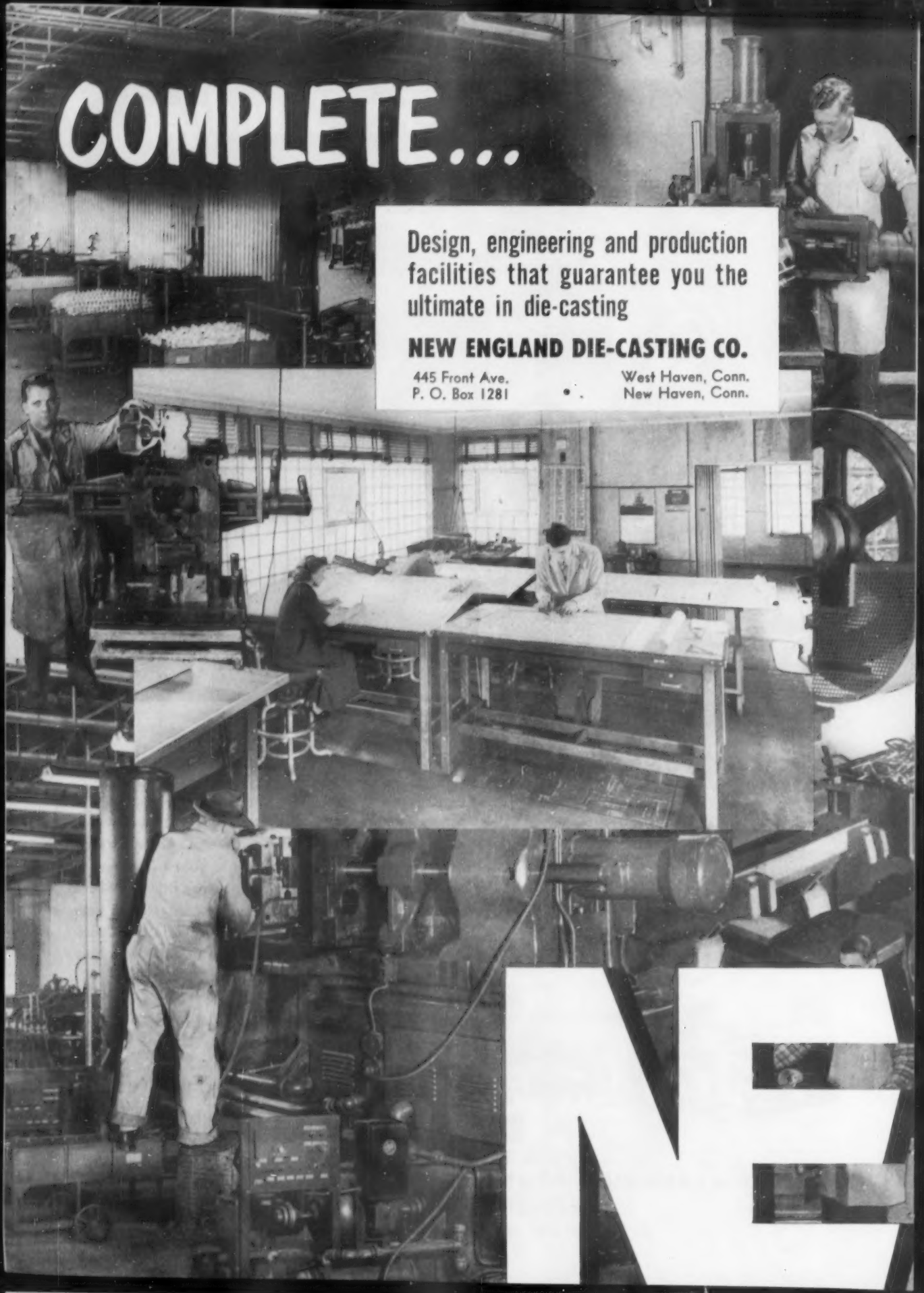
PEERLESS DIE CASTING AND PERMOLD

A DIVISION OF

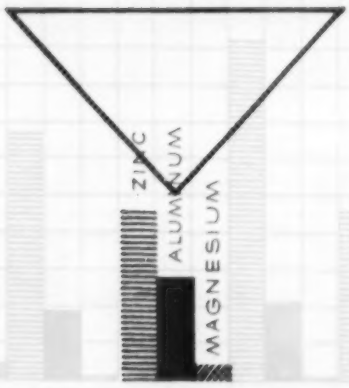
PEERLESS ALUMINUM FOUNDRY COMPANY, INC.

62 ANDOVER STREET • BRIDGEPORT 5, CONNECTICUT

For more information circle No. 54 on the Reader Service Card


COMPLETE...
Design, engineering and production facilities that guarantee you the ultimate in die-casting
NEW ENGLAND DIE-CASTING CO.
445 Front Ave.
P. O. Box 1281
West Haven, Conn.
New Haven, Conn.
NE

Who Buys Die Castings?



HEAVY MACHINERY
AUTOMOTIVE
TRANSPORT
MACHINES, TOOLS
COMMUNICATIONS
BUSINESS MACHINES
BUILDERS' SUPPLIES
PHOTO EQUIPMENT
TIMING DEVICES
APPLIANCES
TOYS, SPORTS
DEFENSE

BUSINESS MACHINES

WILLIAM H. LYON
Vice President
Soundscriber
Engineering Corp.

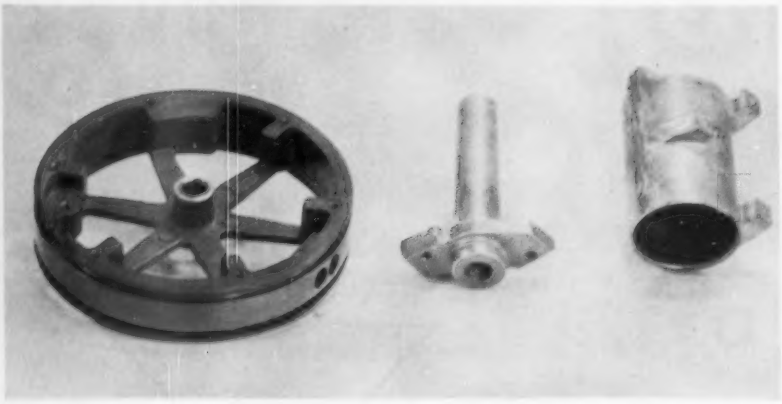
"We find die castings are generally a good choice for machine assemblies requiring close tolerances when fabricating an assembly from numerous brackets and stanchions. The accumulation may be so much that considerable time will be required for adjustments. A good die casting can frequently reduce assembly time and permit closer tolerances without over-all cost increase."

WITHOUT die castings in aluminum, magnesium and zinc, today's office and business machines would probably be so high priced that their use would be sharply limited. Not only has the die casting process materially lowered the cost of many of the individual components, it has also lowered the assembly costs by allowing the use of more complex unit pieces that can be die cast to final size and shape. It further permits the use of low cost, high speed fastening devices that could not be employed if the parts being fastened were not die cast.

Other fabricating methods would require that such complex components as are now routinely die cast, be made of a plurality of pieces and then assembled by hand or, at best, by semi-automatic methods.

Die casting has, further, given the designer a much greater flexibility in styling external appearances then would otherwise be the case. This flexibility coupled, with the wide variety of inexpensive finishing methods that are available, permits the development of improved appearances, reduces worker fatigue by increased visibility, and generally contribute to greater production.

DIE CASTINGS IN BUSINESS EQUIPMENT - - -



TELETYPEWRITERS To speed communications between distant points, the new Page Printer developed by the Teletype Corp. uses numerous die castings of which three are shown. These castings are produced in almost their finished condition at a material decrease in both weight and cost. The spring drum (left operates under constant stress while the dash pot (right) must be completely oil tight. These are typical working parts used by business machine builders.

TYPEWRITERS Contributing to vastly improved appearance, better visibility and decreased worker fatigue; these die cast cover and frame members are used by Remington Rand on their electric typewriters. Through the use of properly designed aluminum die castings the weight of the machines has been reduced and high speed fasteners can be used in assembly.

COMMUNICATIONS

Through the use of a die cast aluminum housing for intercommunication stations, Executone, Inc., has been able to achieve a number of advantages. The shape can be highly flexible, mounting to the chassis is simplified and perhaps more importantly the surface finish can be almost any type and/or color that is desired. Light weight is secured through the use of properly ribbed thin section walls.

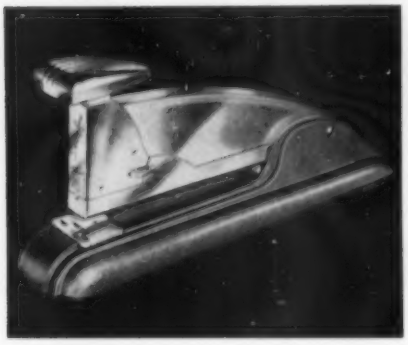
"By die casting, uniformity of parts is assured . . . costly secondary operations eliminated."

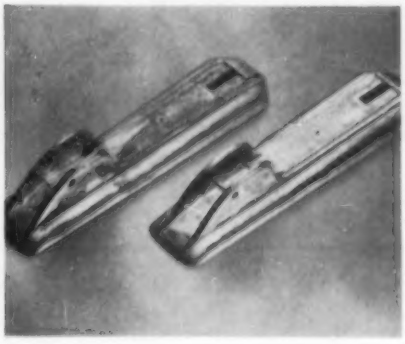
"IT is common knowledge that our ability to produce quality products in quantity is one of the principal reasons why we in this country enjoy a standard of living far above that of other countries. Manufacturing techniques that have shortened the time required to convert raw material into finished parts have contributed substantially to the tremendous industrial progress that has made this high standard of living possible. While no single production technique can be singled out as being more important than the others, die casting must be placed high on the list.

"The Time Equipment Division of International Business Machines Corp. always considers die casting as a possible method of producing both functional and decorative parts for new and existing products, whenever production quantities are large enough to justify it.

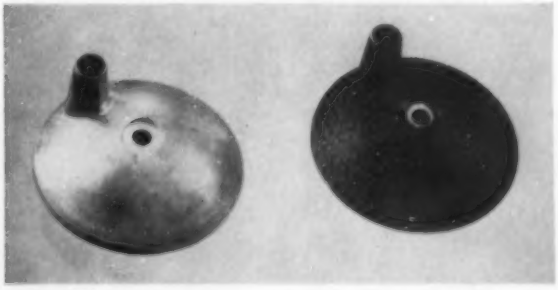
"We have found that substantial savings can be realized by combining several parts . . . a gear or cam and typewheel, for example . . . into one casting. By die casting, uniformity of parts is assured, and tolerances are such that many costly secondary operations are eliminated. Too, castings provide us with parts having a finish suitable for painting without additional processing. These are just a few of the reasons why we use die castings whenever we possibly can."

LELAND J. SLAWSON, Project Engineer, Time Equipment Manufacturing Div., International Business Machines Corp.

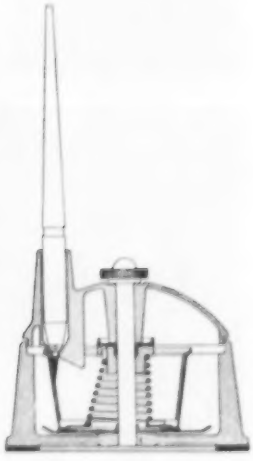




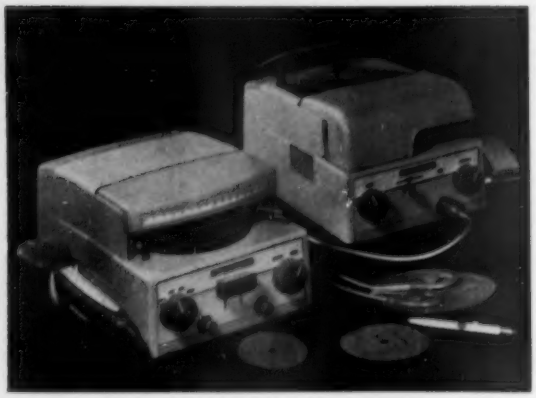
STAPLERS Because they are so universally used, staplers must be produced at extremely low costs. To achieve this low cost and yet produce a tool that will take the constant use and abuse given these products, Speed Products has utilized two die castings for the main structural components. Minimal second machine operations on die castings do much to lower manufacturing costs.

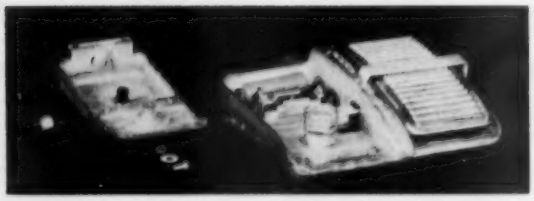


PENCIL SHARPENERS Draftsmen are forever sharpening their pencils. In the past this has meant a sand paper block. Now, thanks to die castings, Elward Manufacturing Co. can produce a pencil sharpener to do a faster and better job. It is probable that no other method could make this cap.

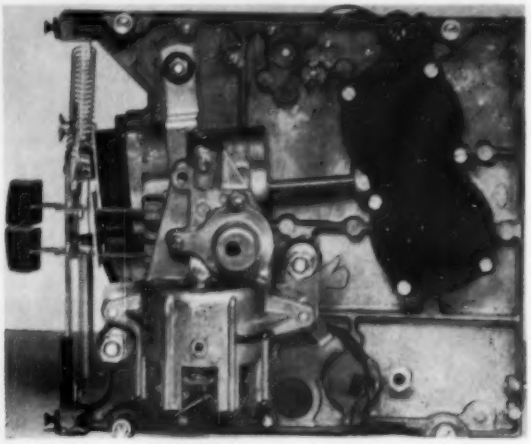


MORE DIE CASTINGS IN BUSINESS EQUIPMENT

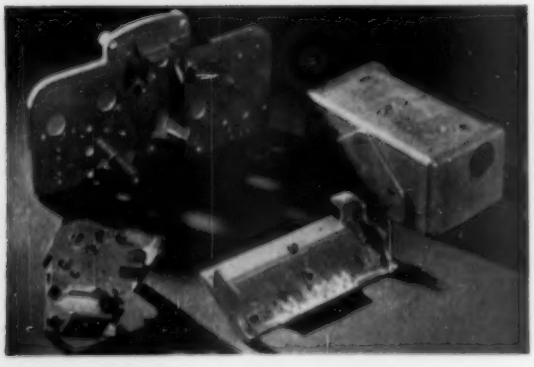


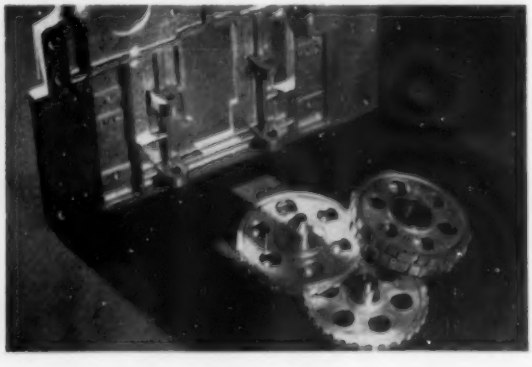


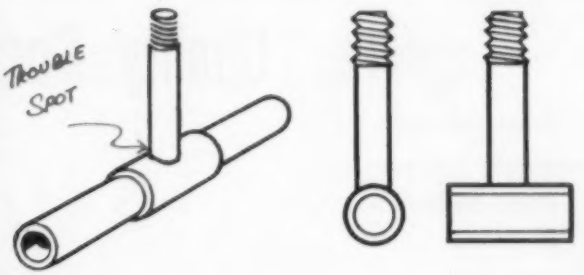
DICTATING MACHINES It can almost be said that The Soundscriber Corp. has designed many of its dictating and transcribing machines around a single feature of the die casting process: the ability to form a single complex casting with a wide variety of complex mounting and fastening devices formed as a part of the casting. This gives low cost assembly because of the accuracy of positioning achieved, and the minimum of machine work required.



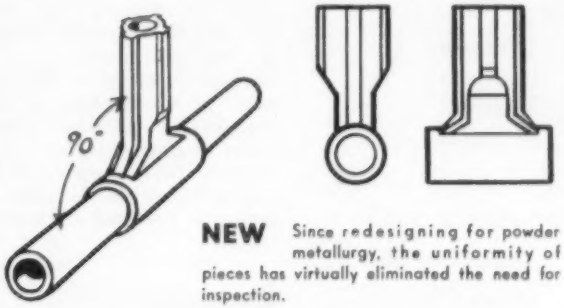
TIME CLOCKS Designing for the die casting process is an old story at International Business Machines Corp. In these two time clocks a few of the many die castings used are shown. Maintaining accuracy over extended periods of time, in spite of hard use, is a principle requirement. Through the use of die castings accurate mounting and freedom from dimentional changes are easily secured. Should a part wear, its die cast duplicate is quickly and easily installed with assurance that no adjustments will be needed to make the clock properly operable.







OLD Misalignment was a common problem when this clamping nut was made by welding a stud to a sleeve. There were so many rejects that 100% inspection was required.



NEW Since redesigning for powder metallurgy, the uniformity of pieces has virtually eliminated the need for inspection.

Eliminated . . . One Inspection Headache!

COVER STORY

By G. C. REISER, Manager
Custom Engineering Dept., Toledo Scale Co.

BY changing from an assembly of two steel parts welded together, to a single piece made from iron powder, the Toledo Scale Co. has been able to eliminate a major inspection problem and to reduce parts purchasing and inventories.

The part in question is a clamping nut used on all models of scales made by the company: either one or two nuts are used per scale. In pendulum type scales, a counter-weight is fastened onto the pendulum and, within limits, the mass of this counter-weight determines the capacity of the scale. Accurate adjustment of the scale at the ¼, ½, ¾ and full capacity points is made by small movements of the weights along the pendulums. Obviosuly, within the range required, the weight must move freely and be capable of clamping to hold it in a precise position.

To secure the required movement, the pendulums carry a jack screw on which the clamping nut rides; the counter-weight is carried by the clamping nut. Two designs of the clamping nut are shown above, along with a photograph of the presently used powdered iron clamping nuts.

As can be seen, the basic design of the two clamping nuts is the same; the difference lies in the method of manufacture. Naturally, when the change in method was made, it was necessary to make some slight modifications in external design, but basically the two units are identical.

Consider first the original design and why it became necessary to change. The nut consisted of an internally threaded sleeve with a stud welded on. To function properly, the stud had to be positioned quite precisely (within 0.005) of the center line of the tubular portion and quite exactly at right angles to the axis of the tube. If either of these condi-

Continued on page 48

Quality Control

TABLE 3

Some process variables and their effect on investment casting quality

Variable	Quality Affected
Wax Injection	
Injection Temperature	Dimensions, Surface
Dwell Time	Dimensions
Clamp Pressure	Dimensions
Injection Pressure	Dimensions
Room Temperature	Dimensions
Wax Pattern Assembly	
Position and Size of Gates	Soundness
Size of Runners and Feeders	Soundness
Weight of Assembly	Soundness
Room Temperature	Dimensions
Dip Coating Assembly	
Viscosity	Surface Condition
Humidity	Surface Condition
Room Temperature	Surface Condition
Investing of Molds (Ethyl Silicate Binder)	
Gelation Time	Surface Condition, Dimensions
Packing Rate	Surface Condition, Dimensions
Temperature	Surface Condition, Dimensions
Pouring of Casting	
Mold Preheat Temperature	Dimensions, Soundness
Pouring Temperature	Soundness
Cleaning and Finishing	
Abrasive Size of Grit	Surface Finish, Dimensions
Blast Pressure	Dimensions

This is the third and concluding portion of this paper delivered by Mr. Yaker as part of a program by the Investment Casting Institute before the Sandia Corp., central research and development agency of the Atomic Energy Commission.

IN addition to the quality requirements which the customer places on the casting, the foundry must also maintain controls during the various steps in the process. In Table 3, left, are outlined some of the important variables in the operations of the investment casting process and the ways they may affect casting quality. The discussion following covers in greater detail the variables listed and the methods of controlling them.

Wax Injection

Accurate regulation of the wax-injection temperature and the dwell time of the pattern in the mold is essential, since these variables affect the shrinkage characteristics of the pattern, and variation in shrinkage results in variation in casting dimensions. In addition, variation in wax-injection temperature may also result in defects such as flow lines, which may impair the surface quality of the casting.

Clamping pressure and injection pressure must be controlled to ensure that the injection pressure does not exceed the effective clamp pressure and cause an opening of the die during the production of the pattern; die opening would result in oversize parts.

Another important variable is the temperature of the room in which the patterns are stored. Excessive temperature may result in distortion of patterns and thus incastings that are dimensionally in error.

Control of wax injection temperature and dwell time requires a suitable temperature control and a regulating timer on the injection unit. To avoid having in-

Of Investment Castings (Part Three)

By **CHARLES YAKER,** Plant Manager
Misco Precision Casting Company

jection pressure exceed clamping pressure, the injection machine should be equipped with a dial indicator between the top platen and the table of the machine which will immediately show any tendency for the die to open.

For further control of the quality of the waxed pattern, all wax patterns are inspected visually. In the inspection, all patterns are scrapped which contain defects that exceed the visual inspection standard required of the casting. In addition, excessive flash and flow lines are corrected. Where dimensional control on a part is critical, the foundry will also set up a gauge inspection of the patterns. This can consist of a periodic check of all critical dimensions about once every 2 to 4 hours. In some cases it may even be necessary to gauge all the patterns. This gauging may consist of checking a single dimension or measuring pattern straightness.

Wax Assembly

The important variables in this operation are position and size of gating, size of runners and feeders, and weight of assembly. Poor control of these items can result in improper metal feed during pouring which, in turn, can result in X-ray shrinkage, poor fillout, etc. The best way to control the variables in wax assembly is by inspecting and weighing each assembly. In this operation, the problem of controlling room temperature to prevent pattern distortion also arises.

Dip Coating of the Assembly

Some of the variables in the dip coating of the assembly which affect casting quality are listed in Table 3. Failure to control these variables can result in castings with very poor surface quality. For example, low viscosity can result in a thin dip coat and penetration of the dip coat by the coarser materials used in the subsequent investing operations. This penetration would result in a rough casting surface. Viscosity of the dip coat must be checked regularly to hold the desired level at all times.

Improper humidity control can result in too rapid drying, poor adherence of the stucco (facing material dusted on dip coating) material, and therefore a poor bond between dip coat and investment. Spalling of the dip coat because of the poor bond results in dirty castings.

Widely varying room temperatures cause expansion and contraction of wax patterns and a serious loss of quality. Since the dip coat has a much lower expansion coefficient than the wax and is extremely brittle, the expansion and contraction will result in cracking and spalling of the coating. Temperature control in the room, as well as in the wax assembly and wax-injection areas, is an essential requirement in the foundry operation.

Investing of Molds

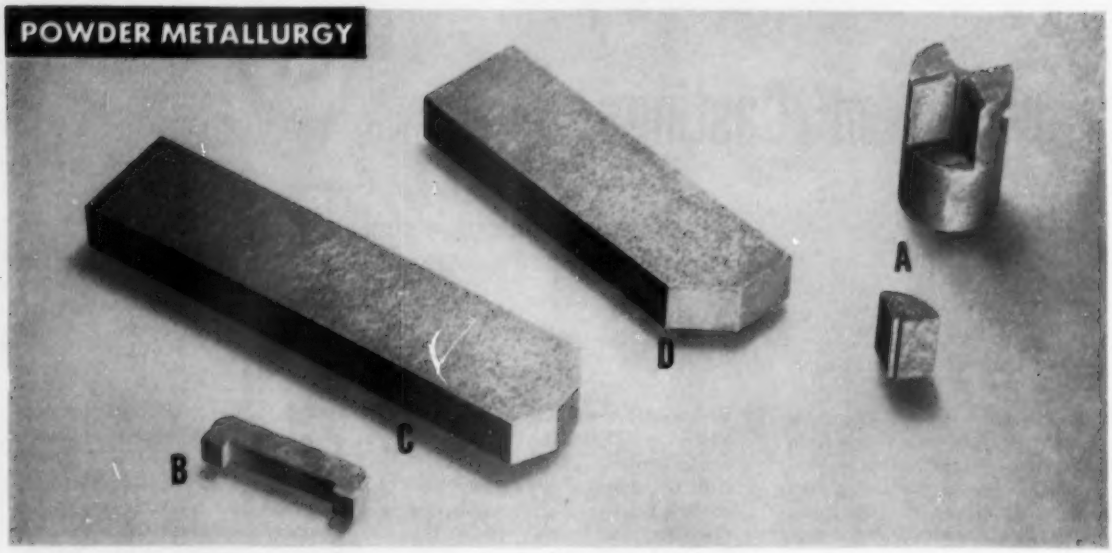
The proper investing of molds is one of the most important requirements in producing an investment casting of good surface quality and dimensional accuracy. Some of the variables involved

Continued on page 70

WATCH THESE FACTORS FOR QUALITY CONTROL . . .

The following items are necessary for the proper fulfillment of the purchaser's quality control requirements by the investment-caster.

1. **A casting blueprint with dimensional requirements realizable by investment casting.**
2. **A material specification with composition and physical requirements suited to pouring of investment castings.**
3. **Agreement on dimensional and quality standards (X-ray, visual, etc.) through the submission of samples by the foundry to the purchaser before production.**
4. **Adequate control of foundry operations so that changes do not occur during the production of the casting which affect the quality agreed upon by the buyer and the foundry.**



These chuck jaws are made of iron powder now. The results . . .

Life Expectancy . . . Up 500% Over Brass Bar

SINTERED metal parts are vitally important to industries looking for cost reductions, but even more advantageous is the possibility of increasing efficiency as well as reducing costs. The Atlas Press Company of Kalamazoo, Michigan has done both by designing parts to fit the powdered metal process.

In the first place they had the problem of designing a chuck to hold the saw blade in one of their table saws. Their original plans were to make the jaw and body from steel bar. This involved screw machine operations plus extra milling operations. The resulting high costs caused them to investigate other materials. They worked with The United States Graphite Company to develop a part from sintered material which would perform properly and be low in cost. The results. . . . .

If you will refer to "A", above, you will see the finishing chuck jaw and body both of which are sintered iron material. The saw blade is pressed in between the small triangular shaped chuck jaw, and the face of the chuck body. A set screw holds the chuck jaw and body in a retainer and also wedges the two parts against the saw blade. The use of sintered iron parts in this assembly saved 80 percent of the original cost of the steel jaw and body. An amazing thing about this sintered iron chuck body is the fact that at such a cost saving it is finished to .0005 total tolerance on the hole diameter and .001 total tolerance on the outer diameter.

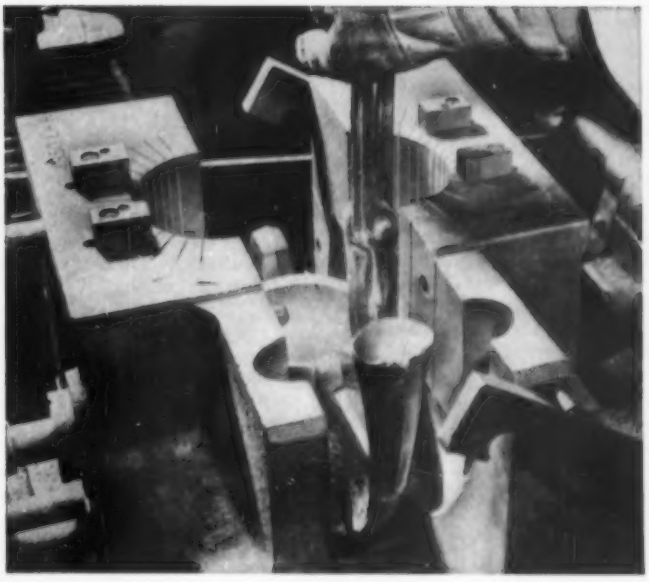
Other parts on which the Atlas and the powder metallurgy firm worked are equally spectacular. A sintered iron "Tail stock ram key" is shown at "B". This key will stop the barrel from turning when stock is being drilled on a lathe. Without the key the stock would begin turning the moment the drill touched it. It was formerly milled from steel. By using a high tensile sintered iron part they saved approximately 50 percent of the former cost.

Two types of jaws are pictured at "C" and "D". The jaws with two bevels are called "steady rest" jaws. These jaws are separated from each other radially and in the same plane by 120°. They hold one end of a bar of metal which is to be machined on a lathe. The jaw material had to be wear resistant because the stock being machined continually rotates around in between them. At first steel was used and then half hard brass. They felt that brass would be a good wear resistant material. When they investigated and tested oil impregnated sintered iron, they found that life expectancy of the jaws had jumped to five times that of brass jaws.

The parts which have only one bevel are "follower rest" jaws. These jaws serve as a guide for long metal bars being machined. They were formerly made from case hardened steel, but by using sintered iron they increased the life expectancy the same amount as they did the "steady rest" jaws. Simultaneously, the use of sintered material allowed a cost reduction of more than half on both type jaws.

A good point to bring out in these cases is the way sintered parts were brought into the picture. They were not expected to compare with the physical properties of the former materials but had to be superior in performance and competitive in cost.

use 'dag' dry films for trouble-free lubrication



Where scratching or scrubbing soon removes an ordinary die coating, 'dag' dispersions adhere to the die surface and provide clean and easy release, casting after casting. 'dag' Colloidal Graphite works into the pores of the die metal, giving a slick, adherent, permanent *dry lubricating film.*

A die-caster tells us that he has used 'Oildag'® – 'dag' Colloidal Graphite in petroleum oil – diluted in carbon tetrachloride to coat his molds, and eliminated pick-up from the molten zinc he casts at 900°F. He makes more than a thousand castings per mold before touching up the dies, and his production has been speeded up more than 200%!

You'll find a surprising number of ways to use 'dag' dispersions described in our free literature. Write today for Reprint DC and Bulletin No. 426-X10.

You get smoother castings, cleaner dies, with long-lasting 'dag' dispersions

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of carriers.

ACHESON COLLOIDS COMPANY

PORT HURON, MICHIGAN

...also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

For more information circle No. 2 on the Reader Service Card

How do aluminum alloy die castings perform in service? Here are the results of many years of tests conducted by the ASTM . . .

Zinc And Aluminum Die Casting Alloys

(Part 2)

By **DONALD L. COLWELL**
Director of Laboratories, Apex Smelting Company

THE usual aluminum base alloys offered for die casting are shown in Figure 9, although of the 10 alloys listed, most have very limited application.[12] SC54A, for instance, was a prewar alloy which developed during World War II into AXS 679 Rev. 3 or SC84A and as SC54A it is practically obsolete. (The B designation is the same alloy with a higher iron allowance). No. 28 is a modification, and one of the early copper-silicon alloys No. XI, which has not had wide enough usage to merit standardization.[9] G8A has attractive mechanical properties and is readily anodized as well as being corrosion-resistant, but it is so difficult to cast that it is seldom used. Its castability can be improved by silicon additions, but such additions are harmful to the peculiar properties of the alloy and therefore use of other alloys is usually to be desired.

The silicon alloys S12A and S5C combine excellent castability with good corrosion resistance and are used primarily in applications likely to be corrosive. Their principal disadvantages are lower yield strength and darker color than the others.

The original study of aluminum alloys made by the ASTM covered 12 different combinations,[18] and these silicon alloys S12A and S5C are the only two of the original 12 now used to any great extent. S12A was originally known as No. V, and corresponds to SAE 305. S5C was originally listed as IV and corresponds to SAE 304. These two have been specified by both ASTM and SAE since 1931 when the first aluminum die casting specifications were adopted, in fact, the SAE designations were selected to tie in with the old ASTM IV and V.

The limits on the other elements in these aluminum-silicon alloys have been the cause of some discussion and disagreement, as there was some feeling that the impurity limits for No. V (S12A) set up by the ASTM originally, were too generous, and that corrosion resistance would be impaired. The ASTM, therefore, decided to make tests on both the Nos. IV (S5C) and V (S12A), and to expose two grades of both alloys.[19] The high purity grades were called IVa and Va, respectively, but unfortunately, the commercial grade of No. IV was lost.

The comparison between V and Va, however, was completed, and bars were tested for corrosion and were aged both indoors and outdoors for 10 years' time. The average compositions of the test bars are shown in Figure 10.[18] The details of the tests have been published during the ten year period in various ASTM Proceedings and they are summarized in an ASTM paper entitled "Investigation of Purity of Aluminum-Silicon Die Casting Alloys".[20]

The effects of the five and ten-year exposure at each of the three locations and the average of the three are shown in Figure 11, and it is apparent that the tensile strength of the commercial grade

9. ALUMINUM DIE CASTING ALLOYS*

Commercial	39	Z39	89-11	Z39-11	13	28	36	43	56	418
ASTM	SC84A-B		SC114A		S12A-B		SG100A-B	S5C	SC54A-B	G8A
SAE	306,308				305		309	35,304	307	
COMPOSITION (%)										
Copper	3.0-4.0	3.0-4.0	3.0-4.0	3.0-4.0	0.6 max	1.7-2.3	0.6 max	0.6 max	3.5-4.5	0.2 max
Silicon	8.5-9.5	8.5-9.5	10.5-11.5	10.5-11.5	11.0-13.0	9.5-10.5	9.0-10.0	4.5-6.0	4.5-5.5	0.3 max
Zinc	1.0 max	2.0-3.0	1.0 max	2.0-3.0	0.5 max	1.0 max	0.5 max	0.5 max	1.0 max	0.1 max
Magnesium	0.1 max	0.1 max	0.1 max	0.1 max	0.1 max	0.1 max	0.4-0.6	0.07 max	0.1 max	7.5-8.5
Iron (Max)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.8	1.0	1.0
Manganese (Max)	0.5	0.5	0.5	0.5	0.3	0.5	0.3	0.4	0.5	0.3
Nickel (Max)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1
Others, Each (Max)	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.1

*Apex Smelting Co.

V (S12A) is higher than that of the high purity grade Va, and that the high purity IVa has a lower tensile strength. In elongation, the conditions are just reversed, except that both of the S12A compositions have elongation values below 2 percent, so that any difference is insignificant.

It is apparent that the slopes of the curves are substantially the same and that one grade has just as good permanent properties as the other, at least under these conditions. Salt spray and other corrosion tests gave similar results.[20]

As a result of this test, it was felt that the current impurity limits of S12A as given in the specifications and in Figure 9 are satisfactory. Furthermore, the commercial grade has been widely used on such parts as outboard motors with entire satisfaction.

With the increasing prominence of the cold chamber machines, certain producers had difficulty with S12A, particularly with low impurity limits, due to its very short freezing range, as it is practically a eutectic composition. When the freezing range was increased by a reduction in silicon content to 10 percent, the yield strength was so low as to make the alloy impractical, and to compensate for this, magnesium was added, resulting in alloy SG100A.

When SG100A was brought before the ASTM for specification, the same feeling concerning impurity limits was evidenced, and again a test of the alloy made to commercial impurity limits and to high purity limits was initiated.[21] The compositions of the two grades as made by each of two producers are indicated in Figure 12, and the results of 1, 2, and 5 years' outdoor exposure at New York and at Sandy Hook are tabulated in Figure 13.[21] Here again, the slopes of the curves show that the effects of corrosion and aging were the same for both grades. The commercial grade had a higher yield strength and a lower elongation than the high purity grade. Both grades showed some decrease in elongation due to the aging of a magnesium silicide type alloy.

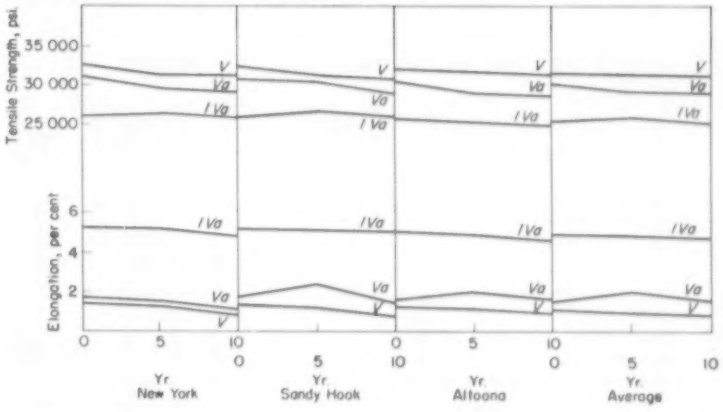
It is necessary to point out that the composition of the high purity grade shown in Figure 12 would probably give trouble in casting. The low iron and manganese contents would exaggerate die washing and the tendency to solder. The 1 percent or more iron in the commercial grade should be assisted by about .25 percent manganese, to improve castability.

Furthermore, if the high purity grade is made directly from metal from the reduction cell, the dangers of cryolite inclusions and sodium pickup are likely to give a sluggish metal with very serious danger of attack on the die casting die. Staples and Hurst

10. AVERAGE COMPOSITION OF TEST BARS used in ten-year exposure test of high purity and commercial purity S12A alloy

Alloy	Old No.	Grade	Si	Fe	Cu	Mn	Mg	Zn	Ni	Sn	Pb
S12A	V a	Special	11.94	1.20	0.09	0.01	0.005	00	0.01	00	00
S12A	V	Commercial	12.14	1.44	0.42	0.26	0.055	0.52	0.32	0.05	0.025

11. EFFECT OF 10 YEARS OUTDOOR EXPOSURE



12. COMPOSITION OF DIE CAST TEST BARS — Alloy SG100A

Average of two laboratories

	Producers	Si	Fe	Cu	Mg	Mn	Zn	Ni	Sn
Commercial	A	9.77	.99	.22	.52	nil	nil	—	—
	B	9.67	1.23	.18	.55	.02	.11	.01	.02
High Purity	A	9.60	.27	.05	.51	nil	nil	—	—
	B	9.62	.34	.02	.57	.01	.00	.01	.02

13. OUTDOOR AGING AND CORROSION OF SG100A*

		COMMERCIAL PURITY			HIGH PURITY		
		T. S.	Y. S.	Elong.	T. S.	Y. S.	Elong.
Initial		43,700	25,800	3.7 %	43,800	24,300	5.5%
Bell Lab-N.Y.	1 yr.	39,700	26,100	1.95	42,300	25,000	4.3
Bell Lab-N.Y.	2 yr.	40,200	26,300	2.25	41,800	24,700	4.0
Bell Lab-N.Y.	5 yr.	41,000	28,000	2.30	41,600	24,800	2.8
Sandy Hook	1 yr.	41,400	27,700	2.45	43,000	25,400	4.0
Sandy Hook	2 yr.	41,400	27,300	2.10	42,800	25,300	3.6
Sandy Hook	5 yr.	41,500	27,200	2.20	41,200	25,200	3.6
Average	1 yr.	40,600	26,900	2.2	42,600	25,200	4.2
Average	2 yr.	40,600	26,800	2.2	42,300	25,000	3.8
Average	5 yr.	41,500	27,600	2.2	41,400	25,000	3.2

*From Reports of ASTM Committee B-6.

14. MECHANICAL PROPERTIES OF SC84A & B*

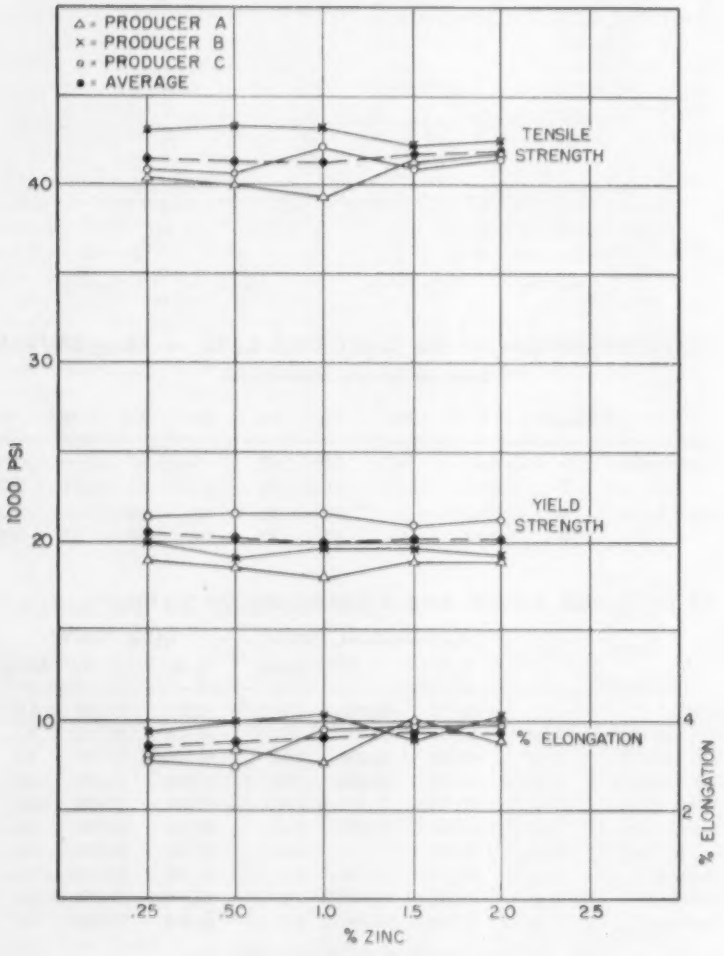
	Tens Str	Yield Str	Elong	Shear Str	Fatigue Str	Charpy Imp.
SC84A	49,000 psi	24,000 psi	4.0%	29,000 psi	19,000 psi	3.5 ft. lbs.
SC84B	47,000 psi	25,000 psi	3.0%	29,000 psi	20,000 psi	3.2 ft. lbs.

*Developed by Committee B-6[21]

15. MECHANICAL TEST DATA OF SC84A TEST BARS

	YIELD STRENGTH psi	TENSILE STRENGTH psi	% ELONGATION
Grand Average	.25% Zn 20400	.25% Zn 41700	.25% Zn 3.4
	.50% Zn 20100	.50% Zn 41500	.50% Zn 3.5
	1.0% Zn 20100	1.0 % Zn 41900	1.0 % Zn 3.7
	1.5% Zn 20200	1.5 % Zn 42100	1.5 % Zn 3.8
	2.0% Zn 20200	2.0 % Zn 42600	2.0 % Zn 4.0

16. EFFECT OF ZINC ON MECHANICAL PROPERTIES



point out that furnace charges containing clean scrap or secondary ingot "produce material which in casting and working gives a more consistent performance than that produced from melts made up of virgin aluminum and hardeners."[22] This difference is well known by the experienced die caster.

By far, the most popular aluminum die casting alloy today is the SC84A type, of which four varieties are shown in Figure 9. The Z39 alloy, orginally known as AXS 679 Rev. 3, was developed from SC54A during the war, and its excellent properties both in the die casting operation and in service have played a large part in the growth of the aluminum die casting industry. As SC84A or SAE 306, the allowable iron content is 1.3 percent maximum, suitable for the product of cold chamber machines. As SC84B or SAE 308, a 2.0 percent maximum iron content is allowed, suitable for the product of the gooseneck machines. Mechanical properties developed by a Special Task ASTM Group are given in Figure 14.[23]

Three modifications of SC84A are also shown in Figure 9. In Z-39, the zinc content has been increased to about 2.5 percent, and in SC114A the silicon content has been increased to 11 percent. In Z39-11, both zinc and silicon have been increased. The higher silicon content was originally requested by the Die Casting Industry Technical Advisory Committee during the war, but was not approved by the Ordnance Department. It is especially applicable to castings with a thin wall where maximum fluidity is required, although the silicon addition makes it somewhat harder and less ductile than the lower silicon. It is an excellent atlernate silicon. It is an excellent alternate

The Z-39 is rapidly coming to the force and is probably more widely used today than any die casting alloy other than SC84A, although it has not yet been specified by the ASTM, the SAE, or the Government. The maximum zinc allowance in AXS 679 had been reduced from 1.0 percent in Revisions 1 and 2, to 0.6 percent in Revision 3 at the time the silicon was increased. At the

Continued on page 95

SHELL MOLD CASTINGS

French heels on women's shoes and the tone arm for hi-fi record player prove that . . .

Magnesium Can Be Cast In Shell Molds

By EDWARD L. TARANTINO
President, Superb Light Alloys, Inc.

A CUSTOMER'S need for low-cost magnesium castings and the desirability of avoiding high tooling and die costs until the cast part had thoroughly proved itself in service for several months led us to tackle and solve the many problems of *casting magnesium by the shell mold process.* Today, as far as we are aware, Superb is the only foundry using shell molds for casting magnesium on a production basis.

While this process will probably never be without some problems, especially for casting magnesium, we now know that every problem which has thus far presented itself can be licked. And we are sure that shell molding has a place in a light metals foundry; that it fills a need when the quantity is too small for economical die casting and too large for economical sand casting. It fits also another situation —when the part must have the density of a sand casting, shell molding can give this density at far lower cost provided the quantity exceeds a thousand units.

Here are two examples . . .

The Case Of The Light Arm

Gray Research and Development Co., Manchester, Conn., wished to develop a new hi-fi pick-up arm. The arm then in use consisted of a sheet metal piece with a plastic covering. The new design was to be all casting, used substantially as cast.

For high-fidelity sound reproduction, the weight of the arm must be kept to a minimum to avoid the necessity of excessive counterbalancing. Pressure of the stylus on the record must be kept within a range of 2 to 3 grams. Gray's chief engineer, Chester Snow, decided to use magnesium for the arm. Lightest by far of all the commercial metals, it also possesses the necessary strength and rigidity.

He and his staff shaped out of solid magnesium various test designs until they had one whose wall thickness, ribbing, counterweighting and other details gave excellent results in service. In a pick-up arm, wall thickness, metal density and structural rigidity must be so balanced and integrated that no resonance is set up to cause interference with the normal vibrations of music reproduction.

Gray entrusted the making of this rather difficult, thin-walled magnesium casting to us. The first casts were made from sand molds because, even though the prototype model had proved satisfactory, changes might be—and were—needed to establish the best production pattern.

The thinnest walls that were practical for sand casting were not quite as thin as Gray wanted them. Thinner walls—Gray's specifications called for 3/32 inch —would not only improve the performance of the arm but would also use less metal and thus help reduce the cost.

Further, Gray engineers were anxious to get a better as-cast finish that would reduce the amount of subsequent labor needed for a fine-textured wrinkle or gloss finish. They believed that, with low costs they could get good sales volume.

Continued on page 67

1. FERROUS RING CARRIER BANDS are bonded into these aluminum permanent mold cast pistons, used by Baldwin Locomotive and International Harvester. Cross section reveals the bi-metallic bond between stainless steel and No. 43 aluminum alloy .250x.

New Properties

The lightness, heat transfer or electrical properties of aluminum now can be combined with the strength of steel

2. STAINLESS STEEL .025 thick has a thick layer of aluminum, formed by permanent mold casting, bonded to its bottom, to produce this bi-metal frying pan.

ORIGINALLY developed for metallurgically bonding aluminum cooling fins on aircraft engine cylinders in World War II, the many advantages of Al-Fin bonding of light metal casting alloys to ferrous metals for products requiring high thermal conductivity, high strength-low weight or high pressure carrying ability has led to numerous casting applications.

The Al-Fin process requires only one additional step over that required for the manufacture of light metal castings. It consists essentially of immersing the ferrous member in a bonding bath immediately prior to placement in the mold which is then filled with the desired light metal alloy. During the immersion phase an inter-metallic bond layer is formed on the surface of the ferrous metal consisting of a thin film of ferro-aluminum alloy.

In the subsequent casting phase the light metal alloys with the ferro-aluminum alloy, the resulting structure having a tensile strength of 15,000 psi and a shear strength of 8,000 psi. The microphotograph, Figure 1, illustrates a typical bond between stainless steel and No. 43 aluminum alloy.

Automotive Pistons

At the end of World War II, the process was quickly adapted for use in high output automotive, truck and bus engine pistons where high loads made bonded-in top compression ring carriers mandatory for long life and low maintenance. Figure 1 illustrates typical Al-Fin pistons which are manufactured in precision type automatic permanent molds, by such companies as the Aluminum Company of America, Bohn Aluminum and Brass, and Permold in this country; Wellworthy, Ltd. in Great Britain, and Mahle in Germany, to mention a few piston licensees of Al-Fin Div., Fairchild Engine and Airplane Corp.

Cooking Ware

The American housewife's emancipation from the kitchen as a result of war jobs started a revolution in the kitchen when she rebelled from the daily drudgery of washing pots and pans. As a result, utensils of stainless steel with their ease of cleaning, corrosion resistance, and gleaming appearance became popular with the ending of wartime material shortages.

Unfortunately, stainless steel proved unsatisfactory for cookware because of its low thermal conductivity which prevents the uniform distribution of heat. Thus, the low thermal conductivity of stainless steel led to the development of the aluminum-bottomed, stainless steel cooking utensils consisting of .025 thick stainless cooking container with 1/8" thick Al-Fin bonded-on cast aluminum bottom.

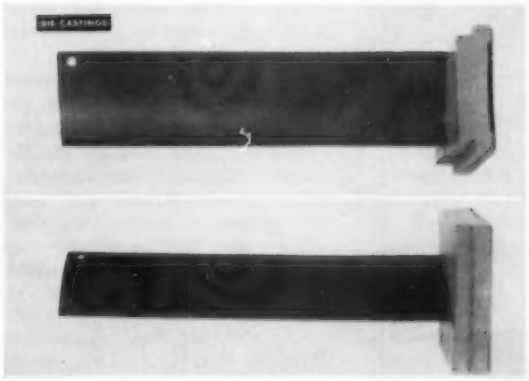
The bonding of the cast aluminum is done in permanent molds permitting a minimum of machining to produce the attractive low-cost cooking ware illustrated in Figure 2. S. W. Farber, Inc. of New York manufactures a complete line of bi-metallic frying pans, sauce pans and sauce pots, and has now introduced a series of electric table-top frying pans of stainless steel with resistance heating element imbedded in the bonded-on aluminum bottom. These table-top units are equipped with a detachable thermostatic control which can be removed to permit complete immersion when washing. Several Canadian and European manufacturers also produce cooking ware by this process.

Electric Motors

In the field of pressure die casting, the Al-Fin process was first utilized in the manufacture of light-weight bi-metallic end housings for electric motors. The aluminum pressure die casting was manufactured with bonded-in steel bearing retainer in order

Continued next page

For Your Products... With Bonded Bimetal



3. DIE CAST ALUMINUM footing formed by die casting makes a practical and relatively inexpensive jet engine compressor stator blade. The blade is a rolled steel section cropped to length.

4. PUMP IMPELLER for aircraft booster pump is made of cast aluminum using investment cores. The steel shaft is bonded in by the Al-Fin process to withstand stresses from rotating speeds up to 40,000 rpm.

to prevent deformation of the aluminum and loosening of the bearing under heavy operating loads.

Gas Turbine Blading

This application was followed by the development of the aircraft gas turbine compressor stator blade consisting of ferrous rolled airfoil section blade Al-Fin bonded to die cast aluminum footing, Figure 3. This development was carried out by Wellworthy, Ltd., in Great Britain, in cooperation with Armstrong Siddley for the Mamba gas turbine because of the latter's interest in reducing the cost of stator blading, thousands of which are required per engine.

Wartime requirements for turbine blades reach astronomical proportions and a simplified method of manufacture is of prime importance since facilities for manufacturing by forging simply do not exist. The problem was solved in this case by rolling ferrous strip to the required airfoil section in twenty foot lengths, cropping to the required length, bonding one end and casting the footing by pressure die casting technique.

The advantages of bonded-on pressure die cast aluminum footings include the elimination of finish machining as well as the freeing of forging facilities. The overall cost per blade in large quantity production was estimated at $.46. An unexpected advantage of Al-Fin bonded construction was greatly increased fatigue life. This was found to be due to the low modulus of elasticity of the aluminum root which greatly reduced blade vibration stresses such as is obtained by rubber mounting of automotive engines.

Electric Irons

With the development of the light-weight pressing iron and its successor, the light-weight steam iron, objectionable features soon appeared in the major weight-saving component, the aluminum soleplate. These included porosity in the soleplate, which caused high manufacturing scrap after partial finishing, and customer sales resistance because of poor appearance; raising of burrs on the soleplate when pressing garments containing hooks, snaps and zippers which subsequently caused snagging threads in delicate fabrics; and corrosion around the steam ports.

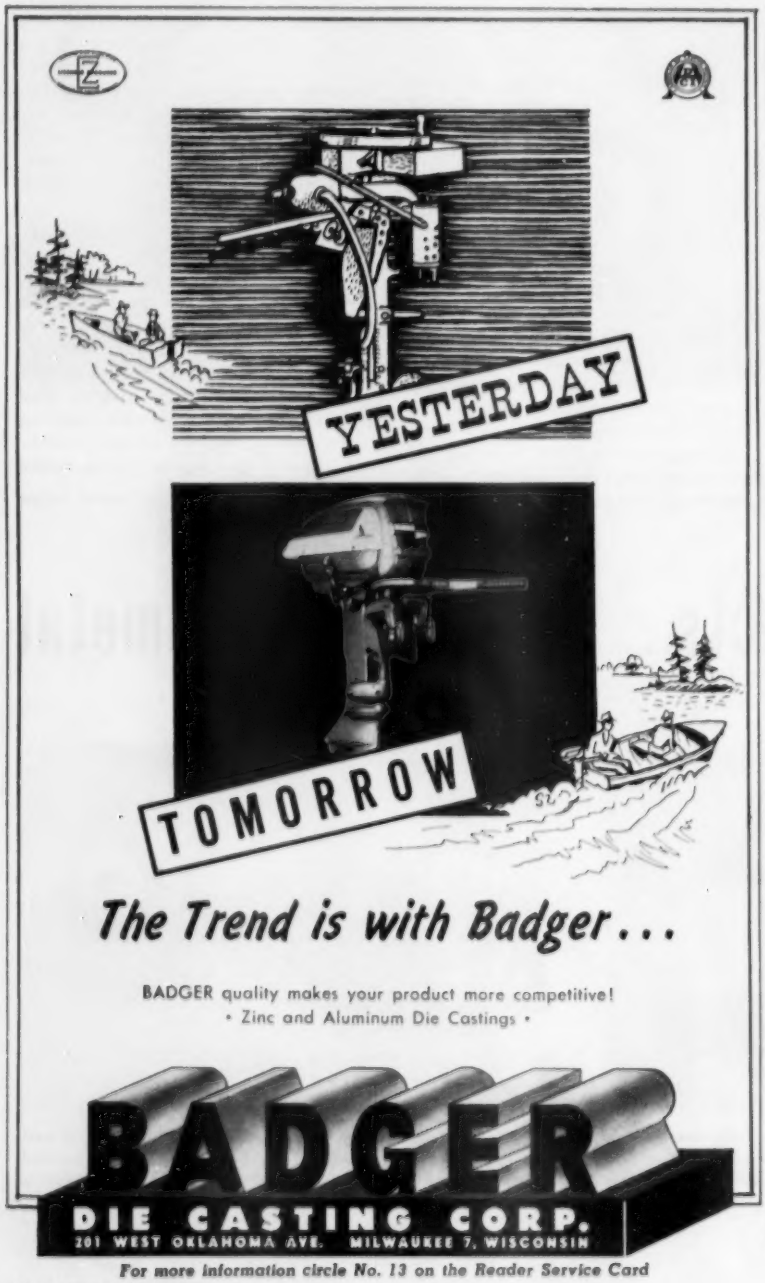
These problems have been solved by bonding thin stainless steel bottoms of the order of .012 thickness, to the die cast aluminum soleplate.

Pressing irons utilizing bonded bi-metallic die cast soleplates are in production by Rival Manufacturing Company of Kansas City for their Steam-O-Matic model. Other manufacturers are perfecting their manufacturing procedures and will soon have Al-Fin soleplates on their production irons.

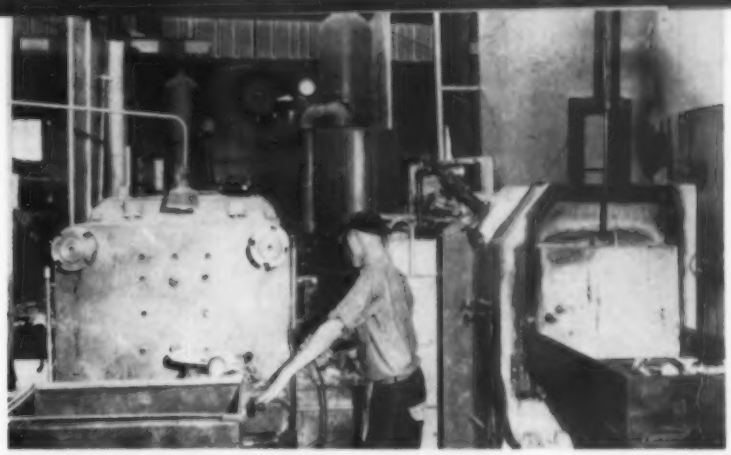
Outboard Motors

For sportsmen, Al-Fin construction is making possible long lived, light-weight and higher

Continued on page 82


YESTERDAY
TOMORROW
The Trend is with Badger...
BADGER quality makes your product more competitive!
• Zinc and Aluminum Die Castings •
BADGER
DIE CASTING CORP.
201 WEST OKLAHOMA AVE. MILWAUKEE 7, WISCONSIN
For more information circle No. 13 on the Reader Service Card

Dry-Hearth Two-Chamber Melting



CONVENIENT LOADING platform and air-operated door are features of the dry hearth furnace, above. Side dipout is also arranged for convenience. Photo below shows typical die castings produced by Madison-Kipp.

EVERY die caster must melt and hold alloys under the proper conditions at a rate which allows maximum output of the die casting machines. Every precaution must be taken to prevent gassing of the molten metal and inclusions of oxide, moisture, and oil. Porosity and sub-standard castings are the direct result of the presence of any impurities in the metal. After many experiments Madison-Kipp Corp., manufacturer of aluminum and zinc die castings, has decided that dry hearth double-chamber aluminum melting furnaces, teamed with their die casting machines, offer the most practical solution to its metal melting problems.

The double-chamber dry hearth furnace, now being used, has evolved to a single unit which contains one chamber for melting aluminum and another chamber for holding the molten bath ready for dipout. Aluminum is charged through the air operated door onto a sloping hearth where it is melted prior to entering the holding bath. This arrangement prevents cold metal from reducing the temperature of the bath below the point of good casting.

These furnaces are arranged with one burner or set of burners for melting the aluminum and another burner for holding melted metal at the correct temperature for dipout. The burners in the melting chamber fire down at the aluminum in order to engulf it completely, without overheating. Moisture is released from the metal before it melts and flows down to the holding bath. This reduces the danger of porosity.

The melting arrangement also has a tendency to drive off lubricants or other impurities which might be included in gates and risers that are charged into the furnace for remelt. Other advantages of the furnace reported by the die caster include easy loading, minimum heat at dipout, accurate temperature control, no stirring of the metal and a hearth that is easily cleaned.

A number of these furnaces have been installed, supplied to Madison-Kipp by Eclipse Fuel Engineering Co. These furnaces have been part of a modernization program. Madison-Kipp has produced castings ranging from less than 1/100th of a lb. to approximately 5 lbs. (a parking meter).

Castings are produced for the home appliance field including small appliances and washing machines, electric drills, housings for electrical switches, oil level control valves, automotive parts, and heavier castings for the transportation industry, particularly railroads. By volume, approximately 75 per cent of their castings are aluminum with the remainder zinc. Work is done to varying tolerances ranging from toy production where tolerances and clearance mean little, to precision switches on which trimming is done with the aid of magnifying glasses.

VACUUM DIE CASTING TO BE EXPLAINED TO NEW CLEVELAND DIE CASTING ENGINEERS GROUP

A new Chapter of the Society of die Casting Engineers was organized in Cleveland at a meeting February 15. Harry Cagin of Halex Die Casting Co. in Cleveland was elected chairman.

Other officers elected by the 65 who attended are: Joseph Goldsmith of Buckeye Mold & Die Co., vice chairman; Lovell Pearch of Rex-Buckeye Co., secretary-treasurer; and Arnold Williams of Cleveland Hardware & Forging Co., chairman of the board.

Trustees elected at the meeting are: Jack Schoonover of Helfrich Die Casting Co., Alfred Holder of Die Casting Finishing Co., Robert Grodkowski of Monarch Aluminum Manufacturing Co., and William H. Schwartz of Lester Engineering Co.

Speaker at the meeting was Alfred Sugar, vice president and technical director of Alloys & Chemicals Mfg. Co., Cleveland.

Plans are now being made for the next meeting of the group. Speaker will be David Morgenstern, president of Nelmor Mfg. Co., who will discuss the recently developed vacuum die casting process. The meeting will be held March 20 at Kiefer's Tavern in Cleveland.

INSPECTION SAVING
continued from page 35

tions did not exist, the nut would bind when operated by the jack screw.

Because so many of the welded assemblies did bind during assembly and initial adjustment of the scales, it became necessary to institute 100 percent inspection. Misalignment was not the only trouble since an appreciable number of the welds failed during assembly, particularly when it was necessary to adjust the angle between the stud and sleeve.

In addition to the heavy inspection load that this method of fabricating entailed, it was necessary to cadmium plate the nuts for corrosion protection.

In the redesign of the nut, a completely fabricated part was developed by co-operation of the design engineers and the engineers of the Michigan Powdered Metal Products Co., the fabricators of the part. As the design was finalized, a completed unit is furnished by the fabricator that is ready for installation. *Over a period of about five years use, the nuts made from powdered iron have proved to be so uniform that inspection has been reduced to less than the statistical two percent normally required for quality control.*

Since the specifications call for a minimum tensile strength of 50,000 psi, the pressed iron part is probably impregnated with copper or brass, age hardening is not necessary. Because of the high copper content of the part, it is no longer necessary to cadmium plate, saving one operation.

Comparable cost figures are not known at this time and 1950 inspection records are no longer available for comparison. It is believed, however, that the powdered iron part is at least as expensive and probably slightly more expensive than the older welded assembly. The great improvement has been in lowering the inspection load and even more important, the speeding up assembly and adjustment.

IN THE WEST IT'S . . .

UNIVERSAL
Die Castings

Preferred when only the best is good enough

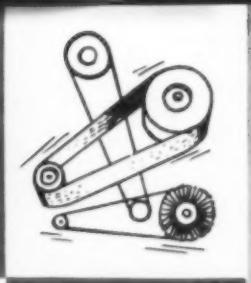
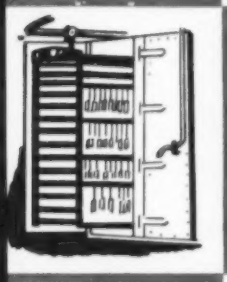
When you buy your die castings from Universal, you are gaining the services of experienced die casting engineers, die designers, production men and management. You are putting a well-equipped shop to work on your castings. You will find, as hundreds of other companies have, that you can depend upon Universal for quality, service, delivery and prices that will help keep your own production costs down.

We Specialize In Brass Die Castings.

UNIVERSAL
DIE CASTING COMPANY

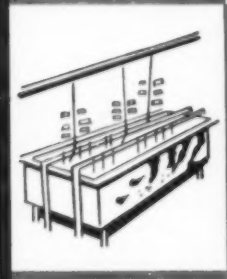
5001-05 Santa Fe Ave. • Los Angeles 58, Cal. • Phone Kimball 7264

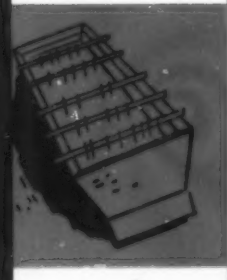
For more information circle No. 68 on the Reader Service Card

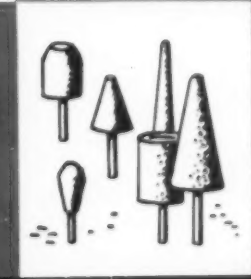



PMM

Finishing Section







Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

devoted to the specialized problems of finishing . . .

DIE CASTINGS • INVESTMENT CASTINGS • PERMANENT MOLD CASTINGS • PLASTER MOLD CASTINGS • POWDER METAL PARTS • SHELL MOLD CASTINGS

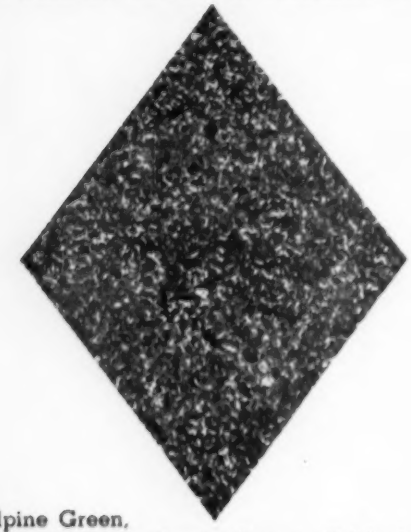
THE MOST AMAZING FINISH DEVELOPMENT IN 100 YEARS!

M & W. CO.

COLOR-FLECKED PLEXTONE®

SINCE 1876

Imagine — a textured *and MULTICOLORED* finish — sprayed at *one* time, from *one* gun, in *one* coat that covers surface flaws and blemishes completely!



PLEXTONE Alpine Green,
one of many standard pre-mixed colors available for prompt shipment. Also available in solid colors and in custom multicolors.

CAPSULE FACTS

WHAT IS COLOR-FLECKED PLEXTONE?

A completely new multicolored industrial finish in which colors exist separately. When sprayed, they form an interlacing color network of amazing beauty and durability.

CHARACTERISTICS

Lacquer base • Air dries approx. 30 minutes — dries hard 2 to 3 hours • Available in flat or semi-gloss • Exceptional hiding power — hides surface imperfections, covers porous materials • Remarkable abrasion resistance • Good chemical resistance • Does not stain • Can be scrubbed, even scoured • Quick and easy touch-up, without showing • Available in non-toxic grades • Bonds readily to primed wood, metals such as cast iron, steel, aluminum, brass, copper, zinc; also plastics, woven fabrics, wallboard, paper, cement, plaster, papier-mache forms.

USES

Manufacturers from coast to coast are using PLEXTONE to finish such products as Caskets • Displays • Furniture • Kitchen cabinets • Machinery • Office panels and partitions • Sewing machine tables • Silver chests • Signs • Store fixtures • Switch gear housings • Table lamps and shades • Toys • TV cabinets • Wallboard

PLEXTONE — CUTS FINISHING COSTS UP TO 35%

PLEXTONE often eliminates many pre-finishing steps on wood or metals. Usually no more than one coat of primer and one PLEXTONE coat are required! And PLEXTONE's texture hides wood knots, metal weld marks, flaws and blemishes.

PLEXTONE — AN UNBELIEVABLY RUGGED FINISH

PLEXTONE's color flecks go "through-the-film"! Resists chipping, cracking and abrasion . . . defies alcohol, grease, and oil! So tough, it can be washed, scrubbed, even scoured with abrasive cleansers without surface damage!

PLEXTONE — DRAMATIC SALES APPEAL OF *MULTICOLOR!*

Color-flecked PLEXTONE offers endless new effects . . . from subtle tones-on-tone to brilliant spatter-dash . . . two, three or more colors sprayed from one gun at one time! New sales appeal for any and all products.

PROVE IT TO YOURSELF—

Mail Coupon Today—Send for FREE color chips. See some of the many color combinations possible. Mail coupon NOW for FREE color chips, PLEXTONE sample and complete application data.

MAAS & WALDSTEIN CO.

2118 McCARTER HIGHWAY, NEWARK 4, NEW JERSEY

Midwest Division: 1658 Carroll Ave., Chicago 12, Ill.

Pacific Coast Division:
Smith-Davis Company, 10751 Venice Blvd., Los Angeles 34

PIONEERS IN PROTECTION • OUR 80TH YEAR

PLEXTONE®

MAAS AND WALDSTEIN CO., PLEXTONE DIVISION
2118 McCarter Highway, Newark 4, New Jersey

Gentlemen: Please send me FREE color chips, PLEXTONE sample, and application data.

I am particularly interested in PLEXTONE for finishing_____

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

For more information circle No. 79 on the Reader Service Card

Doubled output without increasing equipment, conveyors or labor force, is reported a feature of this new . . .

High Speed Nickel Plating Process

INCREASING output on a production line that is already working at full capacity usually implies the installation of new, capital equipment. However, a means of doubling the output of bright nickel plating without investing in new conveyors, enlarging tank installations, changing racking methods or increasing labor force, has recently been introduced.

The high-speed nickel plating system developed by Hanson-Van Winkle-Munning Co., is reported to have a deposition rate 100 percent higher than the fastest process in use previously.

Key to the new process, called Levelume, is a special addition agent which makes it possible to use an activated carbon pack in the filter of the plating solution. This continuously removes harmful organic contaminants. Consequently, costly and time-consuming batch purification is not required.

As is indicated by the name of the process, one characteristic is a high degree of leveling, to fill in scratches or minor defects which reduces or eliminates buffing and coloring after plating.

Five other features of the process, which has already been installed by a major automobile manufacturer, include:

1. It is characterized by good ductility and controlled stress in either the compressive or tensile side, which means no cracking, crazing, lifting or brittleness of deposits.

2. It is effective within a wide current density range — from 20 to 150 asf (normal 60 to 100 asf). (Higher current densities mean faster plating.)

3. Objects can be double coated, if higher corrosion protection with a given nickel thickness is desired.

4. It produces deposits with high surface activity; thus plated surfaces accept chromium and other deposits without additional treatment. The process, for example, reduced chromium plating rejects 12% for one manufacturer.

5. Recessed areas have uniform brightness without shading.

Other claims for the new process are: bath stable in operation, pleasing white color deposits, simplified control, high tolerance to impurities and low operating costs. With the bath agitated and continuously filtered, roughness of deposits is not encountered.

Levelume plating temperatures range from 145 - 160 F., with 145 normal for plating zinc die castings, 160 normal for steel. pH runs between 2.7-3.5 electrometric.

TECHNICAL REPORT

A working guide to

Organic Coating of Die Castings

CHECK LIST FOR ORGANIC FINISHING

☐ **SELECTING THE FINISH**
Have you checked all four of the basic considerations in selecting a coating: sales appeal, adhesion, serviceability and economy of application?

☐ **SURFACE PREPARATION**
Are you making sure the die cast surfaces are mechanically clean and chemically neutral before painting?

☐ **CHEMICAL TREATMENT**
Are you taking advantage of one of the chemical treatments specially developed to use under paints?

☐ **APPLICATION**
Are your painting methods up-to-date, taking advantage of such new developments as electrostatic spraying, painting, heating, etc.?

☐ **DECORATIVE TECHNIQUES**
Are you getting maximum economy in spray masking applied with specially designed high-production equipment?

☐ **DRYING AND BAKING**
Are you getting maximum economy in drying by investigating the new types of drying ovens?

MORE than any other type of finish available to product designers for use on die castings, organic coatings offer variety . . . variety not only in color, but also in texture, service characteristics, method of application and decorative possibilities.

This versatility accounts for the growing popularity of paints, enamels and lacquers for finishing die castings. By their nature, die castings are produced and sold in large quantities, in market areas where surface finish is an important sales factor. The household appliance, business machine, automotive, photographic and home workshop industries . . . to mention only a few . . . have all become important users of organic coatings.

The paint formulators, equipment manufacturers and decorating specialists have given the manufacturer a virtually unlimited choice of finish for his die castings. To the inherent advantage which die cast parts have over molded plastics—their physical strength—has been added the eye appeal of color plus texture gained by painting.

This article is designed to acquaint the designer with the range of finishes and finishing techniques that are at his command under the general name, organic finishes.

Selecting the Finish

Choice of an organic finish involves four basic considerations: 1) Appearance, 2) Adhesion, 3) Ability to withstand specific service conditions, 4) Ease and economy of application.

Paints were, at one time, limited to a narrow range of gloss or matte finishes, but now the appearance of a painted surface can include a number of novelty or specialty effects, as well as metallic, gloss, matte and texture. Multi-colored finishes applied with a single gun have been developed, as have such decorative effects as wrinkle, crackle, hammer-type and opalescent.

Appearance can further be enhanced by means of decorating techniques that have been developed to a high level of efficiency. These include using two or more colors by such techniques as area masking, filling and wiping and cap-masking. Several manufacturers have concentrated on methods of making masks, as well as production equipment for mask-spraying and related operations.

Adhesion of paints was, at one time, a severe problem that prevented full utilization of organic coatings, because the surface of a die casting is smooth and has a natural quality that has sometimes been described as "slippery". To overcome this natural resistance to holding paint, a number of chemical pretreatments have been developed and some paints have been formulated specifically for die castings with ingredients which promote adhesion. So effective are the methods of achieving good adhesion that the designer can dismiss this consideration in selecting the exact surface finish he wants. Any finish can be applied in a way to assure adhesion.

Ability to withstand specific service conditions has also received great attention from the paint formulators, with the result that organic coatings are available that have high resistance to abrasion, chemical attack and other service conditions. These are available, generally, in many colors or surface qualities.

Mechanization has found its way into the paint departments of today's manufacturers, just as it has in other phases of production. The conveyorized, completely automatic paint line, is now commonplace. In fact, some lines require little human attention after the castings are suspended from the conveyor hooks, except to transfer castings from one line to another, or to touch up hard-to-reach areas with manual spray.

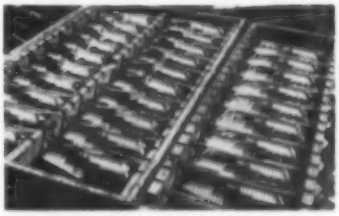
Heated paint; electrostatic spraying; automatic masking, wiping and mask-washing; mechanical dipping; barrel coating; high speed paint baking units . . . have all contributed to the lowered cost and improved uniformity of organic coatings on die castings.

Surface Preparation

The most critical phase in getting optimum quality in organic coatings over die castings lies in surface preparation of the casting. While some paints have been developed with the specific function of obscuring minor surface defects such as flow marks, pin-

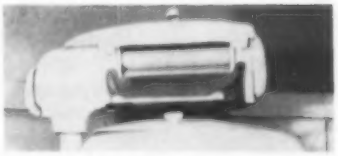
MILLIONS OF DIE CASTINGS LIKE THESE ARE PAINTED

HAND TOOLS



AUTOMOTIVE TRIM

OFFICE EQUIPMENT



HOUSEHOLD APPLIANCES

OUTDOOR EQUIPMENT

TOYS AND NOVELTIES

FACTS YOU'LL WANT TO KNOW ABOUT SOME COATINGS

	SURFACE PREPARATION	PRIMER	APPLICATION
LACQUER ENAMEL*	Normal polishing & cleaning; enamel can be applied directly over Zn or Al die castings without chemical treatment for some alloys and for outdoor exposure, chemical pretreatment is recommended.	None	Spray or dip using conventional equipment and methods.
VINYL RESIN COATING**	Little polishing except parting line removal; Normal cleaning; Chemical conversion coating recommended as pretreatment.	Air-dry wash or special baked primer.	Spray: fluid pressure 20-60 psi, air pressure 60-100 psi. Apply 1½-15 mil film; After 30 sec., apply texture agent, clear or colored, to develop pattern.
WRINKLE ENAMEL***	No polishing except parting line removal; Normal cleaning; Coating covers minor surface defects. Chemical pretreatment optional, depending upon service conditions.	Undercoat is optional; With light colored wrinkle, use a neutral wrinkle primer.	Spray: fluid pressure 8-10 psi; air pressure 65-80 psi; Complete atomization is necessary to avoid "fish eyes".
EPOXY RESIN COATING†	Normal polishing & cleaning; Surface defects should be polished out. Chemical pretreatment not required.	None	Spray using conventional equipment.
MULTI-COLOR ENAMEL††	Minimum polishing needed; Normal cleaning; Chemical pretreatment optional, depending upon service condition.	Special air-dry primer ready for top coat in 3 hrs.	No special spray equipment or methods needed; 2 colors sprayed simultaneously in single spray coat; Spray — fluid pressure 20-50 psi; air pressure 20-60 psi. Atomizing pressure affects spray pattern.
METHACRYLATE LACQUER	Polish & buff to final appearance, since lacquer is water white and reveals exact surface condition; Clean with alkaline or phosphoric acid cleaners.	None	Spray: Fluid pressure 20 psi, air pressure 65 psi; Hold gun about 6" from metal surface; Recommend 2 coats; Spray to leave 0.0005 dry film.

* Maas & Waldstein Co., Dykast Lacquer Enamels.
** John L. Armitage Co., Armorhide polyvinyl chloride formulation.
*** Maas & Waldstein Co., Duart Wrinkle Enamels.
† Chemical Coatings Corp., Epon (Reg) formulation.
†† Maas & Waldstein Co., Plextone Enamel.

ORGANIC COATING (continued)

holes and the like, it is still essential to provide a surface which is:

1. Mechanically clean,
2. Chemically neutralized and inactive,
3. Slightly roughened or etched,
4. Suitably primed or undercoated.

Where a smooth, hard finish is specified, such as is used on scientific instruments, certain household appliances, and electrical equipment, additional work must be applied to polishing out small surface irregularities.

Cleaning with an organic solvent, such as trichlorethylene, or in an alkaline solution, has proved to be satisfactory. Determining factors appear to be the degree and nature of the soil on the metal surface, as well as the physical layout of the existing finishing line.

While some paints have good adhesion to the raw die cast surface, it is generally considered desirable to use a chemical pretreatment where maximum adhesion is required, or where the castings are to be exposed to outdoor service.

A number of chemical pretreatments have been developed* which neutralize the surface of die castings, and provide a slight tooth for mechanical bonding. One of these systems should be applied before painting for best results. These systems are principally chromate or phosphate chemical dips, applied either at room temperature or in heated bath. These are simple, inexpensive and can be tied into a mechanized paint line.

Roughening of a surface by abrasive blasting is also practiced as a means of giving the castings a clean surface and a "tooth" at the same time. Some die cast aluminum household appliances have used this technique.

Use of a suitable primer coat is advisable where good performance is needed. A primer must be chosen which is not only compatible with the basis metal on which is applied, but also with the finish coat. The use of a primer inhibits corrosion, insulates the metal and serves as a firm base for the finish coats.

* See "Surface Protection for Die Castings," PMM, Dec. '55, pg. 66.

Some ingredients of the primers are influential in gaining best serviceability in the finish coats. Zinc chromate, ammonium ferrous sulphate or similar pigments, suspended in a synthetic resin vehicle, are reported to be particularly resistant to moisture or chemical attack. Metal powders, such as aluminum, have been used under metallic type finish coats, while alkyd base primers are also described as effective undercoatings.

The Finish Coat

Choice of a finish coat will be chosen with an eye to sales appeal and a knowledge of service conditions to be met. Certainly, the stylist and engineer can select just the right finish to meet their special requirements.

Perhaps oldest among the specialty finishes is the so-called wrinkle, which takes advantage of a natural tendency of certain formulations to pucker slightly upon drying. This can be very accurately controlled to give a very fine texture so as to appear simply matte, or can have coarser wrinkling for more prominent textured effects.

THAT ARE SUITABLE FOR DIE CASTINGS . . .

DRYING & BAKING	SOLVENT	APPEARANCE	PROPERTIES	USES
Air dries out of dust in 5-10 min.; hard in 1 hr. Baking not needed.	Special thinner	Gloss, eggshell or flat; Covers well with a single coat; Available in most colors.	Tough, durable, flexible one-coat finish.	Specially designed for use on die cast surfaces; Used on appliances, office equipment, etc. Not recommended for use over bright chromium.
Bake 350 F for 15 min. Temperature buildup takes 10 min.	Toluol	Textured plastic finish resembling grained Morocco leather; Masks surface defects; Available in most colors; Color or pattern can be varied.	Highly resistant to chemicals and abrasion; Taber factor is 35 with c.s. 10 wheel for 1,000 cycles.	Automotive trim, business and vending machines, machine tools, giftwares, etc.
Bake 250 F for 1 hr.; Baking schedule can be varied; Can use box or radiant ovens.	Special reducer	Wide range of patterns & effects; Colors include pastels as well as dark colors; Metallic effect can be obtained.	Resists chemical attack, such as gasoline, kerosene, alcohol, etc. Good adhesion and wearing qualities.	Widely applied on business machines, instruments, electronic equipment, photo supplies, sewing machines, etc. Used for non-glare surface.
350-42F baking schedule; 30 min.		Smooth, hard and glossy; Available in choice of colors.	Highly resistant to corrosion and abrasion; Adhesion on untreated die casting is good.	Industrial equipment, machine tools, heavy duty appliances, business machines, etc.
Air dry out of dust in 30 min. Can be handled in 3 hrs.; Can be force dried at 200 F after it dries to the touch.	Special thinner	Colors do not merge, but interlace to make attractive pattern; Combination of colors, patterns; Gives good masking to surface of casting.	Resists chipping, abrasion, cracking; Can be washed repeatedly with soap & water, or scrubbed with abrasive cleaners.	Machine tools, appliances, business machines, large equipment of all types.
Air dry tack free in 5 min. maximum hardness 4 hrs.; Can force dry in oven in 1-4 min.	Special thinner	Hard, clear over polished aluminum; Normally water white, but can be dyed; Cannot be pigmented.	Excellent abrasion resistance, good adhesion.	Portable tools, instruments, appliances, hand tools, etc.

The wrinkle type paints, and along with them, the hammered, veiled, crackled and other specialty finishes, have the great economic advantage of completely masking minor defects on the surfaces of castings, thus simplifying inspection and eliminating polishing or other such preliminaries.

The wrinkle paints are easy to apply, can be controlled not only with regard to size of wrinkling, but also the pattern. Typical wrinkle, applied at low viscosity for fine atomization of the sprayed paint, is baked for about an hour at 250 F. Drying and baking schedule can be adjusted to meet other requirements, however. They can be formulated for convection type oven, or infra red baking.

An interesting multi-colored finish[1] introduced into industrial use makes possible the spraying of two colors simultaneously in a single spray coat. This type of finish, now being used for such products as home workshop tools, does not require special spray equipment or techniques, but applies the colors in such a way that they exist as separate colors with a pleasant interlacing pattern.

Hammered type finishes for die castings have also been quite popular, and are gained by spraying a quick-drying synthetic enamel which has a small percent of a special metallic powder. Before this dries, a mixture of the same enamel mixed with volatile solvent, is sprayed at low pressures over the surface. The individual drops of thinned enamel spread out onto the wet base coat, creating a hammered type appearance. This finish is either air or heat-dried.

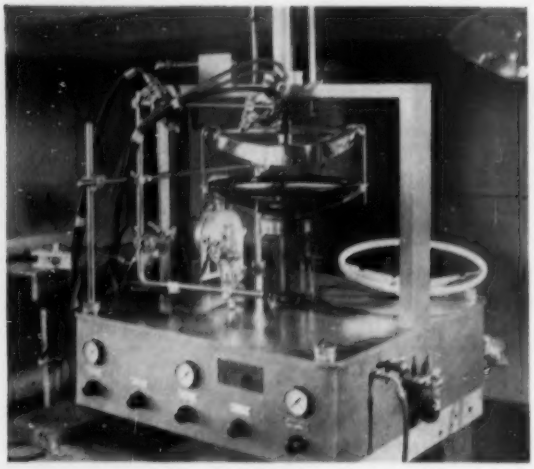
Finish coats are available now using certain synthetic materials for extra durability. One of these[2] imparts a leather-like appearance and is exceptionally resistant to abrasion and chemical attack.

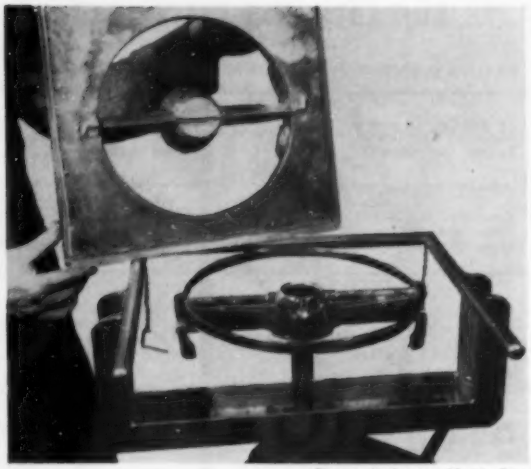
This is an organosol resin coating which is reported by the manufacturer to have ten times the abrasion resistance of wrinkle finishes, and high resistance to chemical action. It is generally sprayed at 60% solids at the gun, making possible a 5 mil film with a single pass of the gun. Its appearance is leather-like, said to resist perspiration, inks and atmospheric chemicals. It has been introduced recently into automotive dashboards and business machines.

Lacquers, which are distinguished from the enamels by the fact that they dry by evaporation of the solvents, rather than by oxidation or polymerization, are widely used, either as clear or colored coatings, with a variety of appearance characteristics. One growing use of lacquer coatings has been in connection with vacuum metallized finishes, although clear synthetic enamels have also been used for base and top coats in this new metallic coating method.

Epoxy resins have been formulated into coatings used on die castings and other metal parts to give particularly effective resistance to chemical attack, scuffing, peeling or flaking. One such coating[3] is being applied very successfully without chemical pretreatment of the zinc and aluminum castings. This formulation is sprayed on and then cured for half hour at about 375 F. Hardness and uniformity of the coating are reported advantages.

Water reducible coatings that





Photos: Conforming Matrix Corp.

SPRAYING A TWO-TONE STEERING WHEEL for an automobile by Sheller Manufacturing Co., Portland, Ind., is done with this special, single spindle painting machine. Here, the workholder also serves as a spray mask. When an automatic hold-down is needed for the top surface, this also serves as a spray mask. Position of the 2 guns may be adjusted, and 3 or 4 guns may be employed. Spindle rotates at 50 to 400 rpm, with length of spray dial regulated. This type of paint spray masking unit is adaptable to many different shapes of die castings.

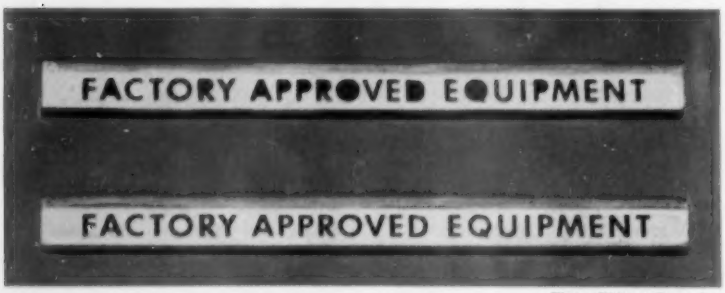


Photo: William Floge, Inc.

MASKING FOR WIPING saves a great deal of production time by reducing the amount of excess spray that must be wiped from the raised surfaces. Top piece is as sprayed, bottom piece is after wiping.

Photo: Finish Engineering Co.

AUTOMATIC FILLING AND WIPING is done on this machine which has six holding nests that index past the loader, the paint gun and the wiper.

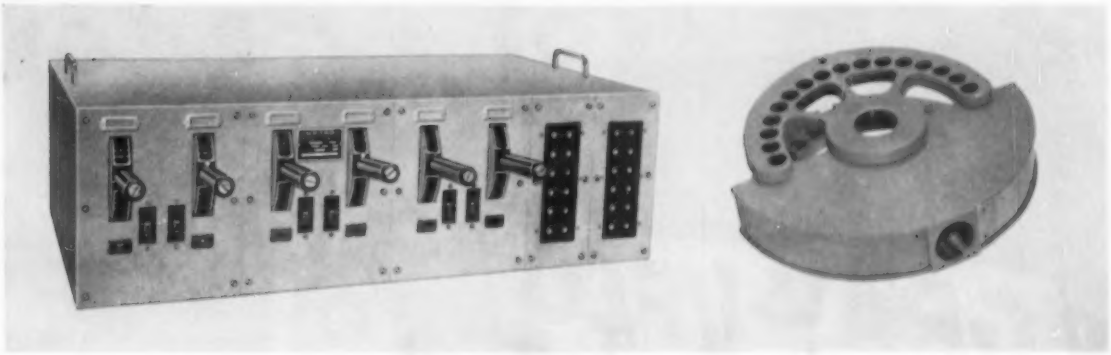
ORGANIC COATINGS (continued)

have good adhesion to zinc or aluminum die castings without pretreatment have also been placed on the market within the past two years[4]. These coatings, available in a range of colors and glosses, eliminate the fire and health hazards present when organic solvents are used.

Paint Application

Painting of die castings must be keyed to big volume production, inasmuch as die casts are rarely used except where large numbers of pieces are being processed. Certain manufacturers of equipment have developed units for rapid, automatic or semi-automatic painting. These will be mentioned here, and in subsequent paragraphs, some of the special apparatus for decorating die castings will also be introduced.

The conveyor on which a die casting can be suspended and rotated as it moves, is the central member of many finishing systems. The paint is then applied by one or more spray guns mounted at varying angles to strike every surface of the workpiece uniformly as it passes and rotates. In its simplest form, this consists of conventional spray guns mounted in groups to catch the surface, but the introduction of electrostatic paint spraying has permitted certain economies such



EPOXY RESIN-BASED COATING is used by The Superior Electric Co. of Bristol, Conn., to achieve high grade finish on several die castings, and at the same time, guard them against chemical attack or atmospheric corrosion. The cured formulation offers high adhesion to die cast metals, reducing chance of scuffing, peeling or flaking. Included in the electrical equipment components using these Epon* resin based formulations, are power supply enclosures, drums for operating levers of light controls and variable transformer bases, all die cast of zinc or aluminum. After casting and machining, the die castings are vapor degreased and then sprayed with an Epon formulation supplied by Chemical Coatings Corp. It is cured at 375 F for at least half an hour. Sampling inspections assure uniform film thickness of 2 to 3 mils min. (*Epon, reg. trademark, Shell Chemical Corp.)

Photo: Shell Chemical Co.

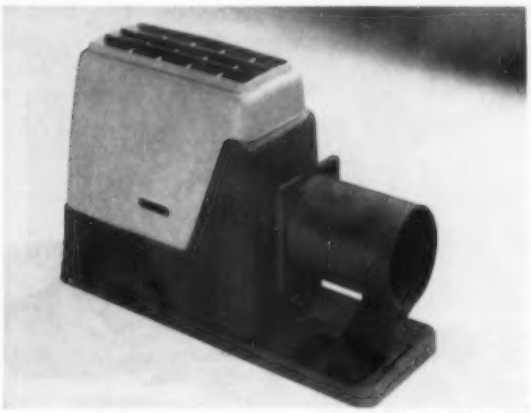


Photo: Allied Research Products

CHEMICAL TREATMENT anchors this wrinkle type paint to its die casting. Both aluminum and zinc die castings in this projector unit are treated with Iridite, a chromate type conversion coating that resists corrosion and provides for good paint adhesion.

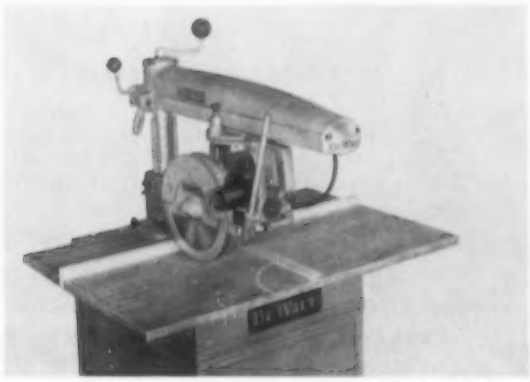


Photo: Maas & Waldstein Co.

MULTI-COLORED PAINTING by means a finish called Plextone, gives this De Walt radial saw a handsome appearance. Although sprayed simultaneously, the paint colors remain separate on the surface of the casting to give an interlaced effect that is pleasing to the eye. It also is a durable finish that masks minor surface irregularities of castings.

as the elimination of overspray, provision of uniform coverage, etc.

Electrostatic painting is accomplished by connecting the gun to a source of electrostatic high potential, and carrying the work to be coated past the gun on a grounded conveyor. The strong electrostatic field between the spray gun and the article to be coated, the coating material is attracted to the surfaces of the article. This can be done either with a conventional type spray gun, or with a bowl-shaped head which requires no compressed air. In this latter system, the organic coating is fed out to the edges of the "bowl" at a uniform rate, where the electrostatic pull moves the coating onto the workpiece.

Dipping is another paint application system adapted to rapid, conveyorized processing. This system, which requires the minimum operator skill, and makes maximum use of the paint, requires that the shape of the part to be painted permit good drain-off. For this reason, this method is less commonly used on die castings due to the complex shapes that are common in die cast pieces.

Continued on page 59

TUMBLE

GRAV-I-FLO

FINISH

TRADE-MARK

of Quality

and Know-How

in the tumbling and mechanical finishing field!

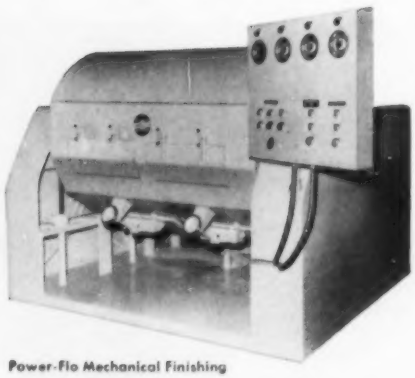
Newest in

MECHANICAL FINISHING

POWER-FLO FINISH

Revolutionary development! Finishes parts previously impossible by tumbling: 1—those that cannot be finished satisfactorily by conventional tumbling; 2—those too large for conventional tumbling.

NOW! Power-Flo Mechanical Finishing Machines finish in high-production all sizes and shapes. Parts held by fixtures, power-driven through specially compounded Grav-i-Flo media. Horizontal reel type or vertical spindle standard models. Also custom-built machines engineered to requirements.



Power-Flo Mechanical Finishing

Leadership in TUMBLING

Smoother, higher lustre finishes with faster, greater capacity machines and more efficient materials by Grav-i-Flo. One or more compartment machines in 66″, 48″, 36″, 32″, and 24″ cylinder lengths. Handle 25% greater volume in 30% less floor space! Complete line of equipment, accessories, and supplies.

Grav-i-Flo Tumbling

GRAV-I-FLO CORPORATION, Dept. PMM-3 400 Norwood Avenue, Sturgis, Michigan

For more information circle No. 76 o nthe Reader Service Card

ORGANIC COATINGS
continued from page 57

Barrel painting is frequently used for small die castings, especially small toys and novelties were bulk finishing gives economical processing. In this system, the castings are simply rotated in a tumbling barrel along with the paint, then dumped out onto a screen that separates the castings from the paint.

Use of paint heaters has gained increasing usage during the past few years. This system employs heat exchangers or other means of increasing the temperature of the paint at the spray head. By heating the paint, a workable viscosity is obtained with a much lower content of solvents.

This permits application of coatings having higher solids content, thus building up a required coating thickness with fewer passes of the spray gun. It permits faster dispersal of the paint solvents and hastens the drying process.

Decorative Techniques

Like all other phases of painting, the decorating of die castings has also been given the benefit of special study. This has been necessary because die castings are, very commonly, intricate in shape. This has meant that special three-dimensional decorating methods have had to be developed.

The production of paint spray masks by electroforming has been the key to the high production decorating of die castings. Great ingenuity has been utilized in making these masks to give precision decorating.

Masking is commonly divided into three general categories:

1. Cap masking, where the elevated portions of a casting are masked and the recesses sprayed;
2. Plugging, where the recessed areas are masked and the surrounding areas sprayed;
3. Area masking, where whole sections of the casting are covered during spraying.

In addition, masks for wiping and for rolling are in use. Several manufacturers specialize in the production of masks for the several purposes listed above, and the range of sizes on which this is practical runs all the way from small knobs and control buttons, to TV bezels and stove-top instrument panels.

The use of these electroformed masks, which conform exactly to the die cast contours, with intricate bridging to hold loose centers or letter caps in position, has been responsible for the development of an entire group of machines to apply these masks on a high-production basis.

Some paint spray masking units are standard, multi-station units, involving application of the mask, spraying with one or more heads, sometimes including wiping and mask washing. Spraying units are more commonly custom built for the specific job, with air cylinders, clamps and specially designed fixtures to apply and hold the mask against the casting during painting. Refinements include techniques for applying two or more colors over various areas of the same casting detail, without losing time by baking between each coating.

Other decorating techniques in common usage now include silk screen printing for nameplates, dials, instructions, etc. This is a method widely used in the sign painting industry, and consists of a silk or other fabric stretched over a frame. Parts of the design area that are to be masked out are coated with a special synthetic material or varnish, while parts to be decorated are left open. The paint, in a thick, viscous form, is pressed through the screen by means of a rubber squeegee as it is held over the workpiece.

Masking with die cut masking tape is also used where plane sur-

THE A.T.U. TAPPING UNIT

Completely self-contained all-electric lead screw unit for single or multiple tapping

THE A.D.U. DRILLING UNIT

Self-contained air-driven unit with sensitive electric control for single or multiple drilling

NEW ETTCO'S Tapping and Drilling Twins ...the versatile combination that solves your small hole problems

A high-production, special purpose combination drilling-tapping machine built entirely from standard Ettco units and components.

NOW—two separate self-contained, built-for-the-purpose units that meet most single or multiple drilling and tapping requirements.

Both units have been designed for extra power, speed and rigidity to insure greater precision at high production rates.

Ettco's Tapping and Drilling Twins are available as individual units or as standard upright machines. They can also be built into automatic drilling and tapping machines simply by mounting them in any desired combination on a standard base. *Write for details—today.*

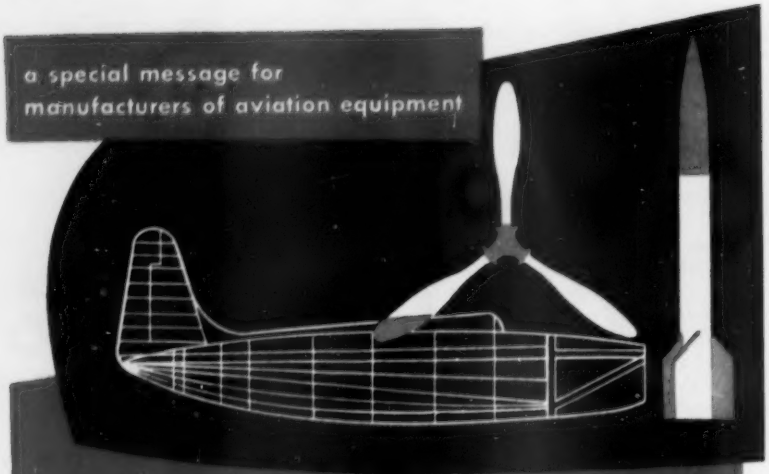
"See your Authorized Ettco Distributor"

ETTCO TOOL CO., INC.
586 Johnson Ave., Brooklyn 37, N. Y.
Chicago • Detroit • Los Angeles • Indianapolis

Ettco-Emrick
the right equipment for every small hole drilling and tapping need.

For more information circle No. 78 on the Reader Service Card

a special message for
manufacturers of aviation equipment



need a finish for
light metal parts?

specify
IRIDITE®

Here's the finish that combines corrosion resistance and paint adherence with extreme ease of application. It can be welded or soldered with no difficulty and presents no problem in "patching" scratches, marks or scraped sections. Here's what you can do with Iridite:

ON ZINC AND CADMIUM you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.

ON COPPER . . . Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.

ON ALUMINUM Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.

ON MAGNESIUM Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified phone book.

Iridite is approved under government specifications

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD

Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals, ARP Plating Chemicals.
WEST COAST LICENSEE: L. H. Butcher Co.

For more information circle No. 71 on the Reader Service Card

faces or one-directional curvature is involved. Filling of recessed lettering by brushing on paint and then wiping the raised surfaces is also in common use. More recently, masks which limit the area of paint application has speeded up the filling and wiping process, while special machines for wiping excess paint have also contributed to the speed of painting.

Drying and Baking

Few high production painting operations (such as are common for die castings) can afford the consumption of space and time involved in air drying. Therefore, most such jobs are done with some form of baking to dry and cure the paint coating.

These ovens sometimes represent the largest portion of floor area used by the painting department, especially in batch type operations. But lately, a trend toward conveyorized drying, with the paint ovens suspended high above the floor, has conserved factory area and increased process efficiency.

Convection type ovens are used for both batch and continuous processing, with the choice of fuel being oil, gas, electricity or steam, depending upon the local cost picture.

On the other hand, three basic types of radiant heating ovens are in use for baking paints:

1. Electrical systems in which infra red lamps are used.
2. Gas-fired systems in which ceramic units are heated to incandescence.
3. Electrical systems using special all metal resistance heating elements.

The choice of heating depends not only upon the metal being processed, but also upon careful analysis of the costs, physical set-up of the plant and rate of production to be sustained.

REFERENCES:

1. Maas & Waldstein Co., Newark, N. J.
2. John L. Armitage & Co., Newark, N. J.
3. Shell Chemical Corp., New York, N. Y.
4. Universal Paint & Varnish Co., Bedford, Ohio

MARK 80TH ANNIVERSARY

Celebration of 1956 as the 80th Anniversary Year for Maas & Waldstein Co., Newark, N.J. manufacturer of lacquers, enamels and specialized finishes, has been launched with sales conferences and a party for plant personnel.

An Unbeatable Combination For Better Barrel-Finishing. The new Norton Tumblex "T" abrasive brings you these advantages for top performance: non-wedging triangular shape; fast-cutting bonded ALUNDUM* abrasive; and 4 sizes for the widest range of applications.

Users praise Norton TUMBLEX "T"

the new bonded, triangular tumbling abrasive

Reports prove Tumblex "T" abrasive brings many new

"TOUCH of GOLD" benefits to barrel-finishing

Here's one of the most revolutionary barrel-finishing innovations ever developed. In typical on-the-job tests, Norton customers report that the new Tumblex "T" tumbling abrasive:

"cuts tumbling cycle time from five hours to one hour."

"finishes steel and magnesium parts that could never before be barrel-finished."

"completely removes burrs from stainless steel parts in four hours. Abrasives previously used failed to do so in 12 hours."

Everything about Tumblex "T" abrasive is designed for better barrel-finishing.

Its uniform triangular shape and size prevents wedging in recesses of parts.

Made of famous Norton ALUNDUM abrasive, it cuts fast, with no compound needed — resulting in shorter time cycles and lower costs per piece finished.

It provides maximum surface contact with parts being processed, assuring top quality work in fastest time.

It wears down evenly, keeping the same triangular shape. No small chips to lodge in holes, slots, etc. — and when worn down it can be used on parts requiring a smaller size abrasive.

Its lightness means less weight required to fill the barrel. Results are more uniform finish, without roll-in or roll-over of edges of parts.

Its chemical inertness, unaffected by acids, compounds or detergents, prevents spoilage common to other types of abrasive.

Send Your Work Samples

to our newly enlarged Sample Processing Department. Let us prove to you how the latest barrel-finishing equipment and techniques can improve your product quality and cut your finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-305

NORTON

ABRASIVES

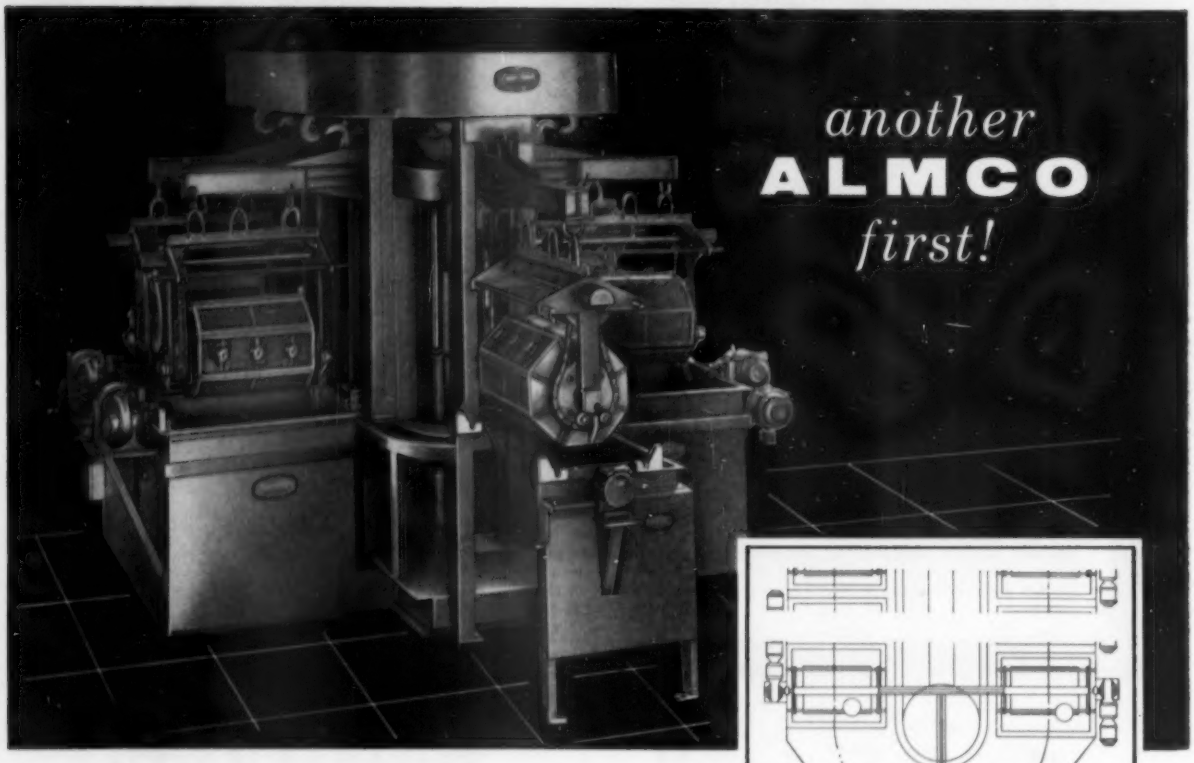
Making better products... to make your products better

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING Division: Coated Abrasives Sharpening Stones • Pressure-Sensitive Tapes

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

For more information circle No. 82 on the Reader Service Card

AUTOMATION / comes to BARREL FINISHING



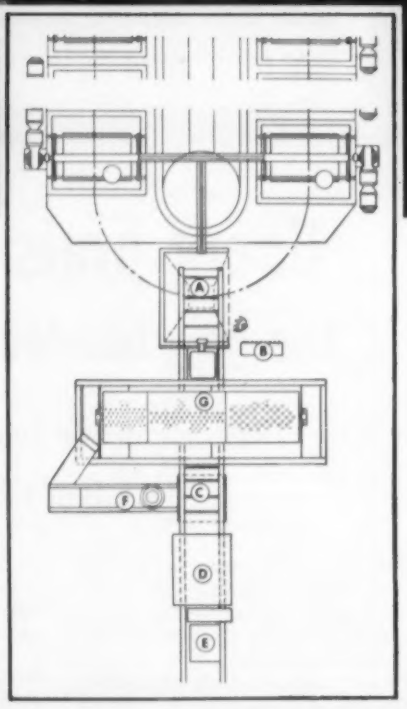
From Detroit . . . Cleveland . . . Chicago . . . New York . . . almost every metal-working center—for more than a year—queries have been coming in asking, "What's this about ALMCO's automated barrel finishing?" Here, for the first time, are all the facts . . .

COMPLETELY AUTOMATIC OPERATION. Supersheen ***SUB-O-MATIC*** submerged-type automated barrel finishing systems, researched and developed exclusively by ALMCO, daily are achieving micro-precision grinding and burnishing of mass production parts by the push of a button. These highly versatile systems can be engineered to handle almost any production requirements; micro-finishing operations performed include descaling, deburring, grinding, burnishing, rinsing and rust inhibiting. And one man, by pre-set controls, maintains continuous production ***through all operations.***

Vital to the peak efficiency of these systems are specially engineered materials handling units (*see diagram*). Even delicate centerless ground steel parts are automatically handled without impingement or peening action. Too, the media is loaded, unloaded, separated and reclassified automatically after every cycle, thus eliminating possible errors or mix-ups.

TREMENDOUS COST SAVINGS. Besides absolutely unequalled finishes on high production parts, cost savings are so great that a Supersheen ***SUB-O-MATIC*** System can actually pay for itself ***in less than one year!*** Money saved on finishing compounds alone can, in some cases, do this. Reduced labor costs, greater production and better finishes are other positive advantages which Supersheen ***SUB-O-MATIC*** Systems have already brought the metal-working industry.

We invite you to sample process your production parts in the Supersheen ***SUB-O-MATIC*** System in our Albert Lea laboratory; you'll quickly see how you can achieve ultra-low micro-inch surfaces and closely-formed radii—not now obtainable even by other barrel finishing equipment—at tremendous cost savings to your company. Write for the new Supersheen Automated Barrel Finishing Catalog, ABF-101.



Parts and media are loaded and unloaded at Station (A). All operations automatically controlled at CONTROL PANEL (B). Parts and media are metered to MAGNETIC SEPARATOR (C). Parts pass along conveyor through DRIER (D) and then to "pick-off" table for assembly or storage. Media drops into VERTICAL BUCKET ELEVATOR (F) and is carried up to ROTARY SCREEN CLASSIFIER (G) where various size media are separated and drop into overhead hopper. Barrels are then reloaded with correct media by air-operated control and ready for new finishing cycle.

ALMCO
DIVISION OF
QUEEN STOVE WORKS, INC.
ALBERT LEA, MINN.

For more information circle No. 72 on the Reader Service Card

USEFUL LITERATURE CATALOGS, MANUALS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

PROCESSES

Cut Costs With Metal Powders: 154
Reese Metal Products Corp. has published a data sheet giving the approximate composition, average physical properties and illustrations of some different parts that have been made.

Permanent Mold Castings: 155
Aluminum Casting & Engineering Co. has available a four page brochure concerning their products and facilities.

Close Tolerance Steel Castings: 156
Lebanon Steel Foundry has a four page brochure that describes the "Ceramicast" process for producing very close tolerance castings in ferrous metals.

Precision Castings: 157
Universal Casting Corp. has published two, four page brochures describing their vacuum casting process for non-ferrous metals. One brochure is devoted to cast impellers.

Investment Casting: 158
Engineered Precision Casting Co. has issued a five page brochure detailing its facilities, policies and personnel for producing investment castings.

Continuous Cast Bearing Bronze: 159
American Smelting & Refining Co. has issued bulletin No. 301 describing their continuous cast bearing bronzes in 5 and 9 inch diameters. Material is SAE 660 bronze.

Powder Metallurgy News: 160
Kwikset Powdered Metal Products Co. is now issuing an external house organ devoted to new and better applications of metal powder parts and illustrating some parts currently being made.

Plaster Mold Casting: 161
Morris Bean & Co. has available reprints of an article that describes the plaster mold casting process and the Antioch Process specifically.

Shell Molded Castings: 162
Electric Steel Foundry Co. has an 11 page data book that lists the properties of shell mold cast alloy and stainless steels and describes the shell mold casting process.

MATERIALS & EQUIPMENT

Beryllium Copper Dies: 165
The Beryllium Corp. has published a new four page folder describing the applications of beryllium copper in the manufacture of zinc die casting dies as well as other metal forming dies.

Powdered Iron Manufacture: 166
Plastic Metals Div. of National-U.S. Radiator Corp. has issued bulletin No. 2 which describes the processes used to manufacture electrolytic and reduced iron powders.

Shell Mold Making Machines: 167
Shell-O-Matic, Inc. has a brochure that describes the different machines manufactured by the company for use in the production of shell molds.

Synthetic Fluids & Lubricants: 168
Carbide & Carbon Chemicals Co. has issued a 52 page book on synthetic fluids and lubricants. Covered are properties, applications and characteristics of these polyalkyleneglycol derivatives.

Chrome Sealer for Aluminum: 169
Conversion Chemical Corp. has data on properties, costs and uses of their new chrome sealer for aluminum. This is a low resistance coating.

Metallurgy of Exhaust Valves: 170
First issue of a new Engineering Bulletin from the Valve Div., Thompson Products, Inc., is devoted to metallurgical considerations for automotive exhaust-valves. This technical journal by company engineers will be published regularly.

Air Power: 171
Mead Specialties Co. has a 53 page catalog of the different air powered devices made by that company. Both equipment and suggested applications are shown and described.

Heat Treating Furnaces: 172
Auto-Control Laboratories have published a one page descriptive leaflet on the small and medium sized heat treating furnaces for tool and die work.

Metal Filled Epoxy As Profiling Master: 173
Shell Chemical Corp. has issued a reprint describing an aluminum powder-epoxy resin mixture that is recommended as a casting material for making master models for pantograph die sinking.

Die Lubrication Data: 174
G. W. Smith & Sons, Inc. have published a wall chart giving the properties, uses, etc. of their complete line of metal working lubricants.

Working of Tool Steels: 175
Allegheny Ludlum Steel Corp. has a new Blue Sheet, No. 17. This is a 16 page report giving detailed information on the working of tool and high speed steels.

Bright Hardening Stainless Steel: 176
Surface Combustion Corp. has just issued the latest edition of the Heat Treat Review. This issue is devoted to the bright hardening of stainless steel.

Disc Grinders: 177
The Besly-Welles Corp. has just published a new condensed catalog describing the types of disc grinders available.

FINISHING

Buffing & Grinding Chart: 180
Hanson-Van Winkle-Munning Co. has issued a new chart for determining the surface speed of buffing and grinding wheels. Covered are wheels from 1" to 60" in diameter at speeds from 220 to 20,000 rpm.

Barrel Finishing Media: 181
Universal Tumbling Supply Co. has six data sheets available that describe the tumbling media, chips, burnishing compound, honing compound, etc. that are available.

Spray Decorating Machine: 182
Conforming Matrix Corp. has issued a new descriptive sheet on an air activated spray decorating machine. The machine described is portable and quite versatile.

Vapor Degreaser: 183
Manufacturers Processing Co. has a leaflet that describes a new vapor degreasing machine recently developed. Direct washing with solvent may also be employed when desired.

Continued on page 65

DO YOU NEED ANSWERS TO THESE QUESTIONS?

1 How can I electroclean steel at lower cost?

2 How can I find a brass cleaner that gives better protection against tarnishing?

3 How can I reduce rejects due to faulty electrocleaning of zinc die castings?

***Answer* 1** Following an Oakite recommendation, one plater made a small change in his steel-cleaning cycle and soon had two tankfuls of cleaning solution doing the work of three—and the plate adhesion was improved. *See booklet offered below.*

***Answer* 2** Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current. *See booklet offered below.*

***Answer* 3** Oakite has an anodic conditioner that offers brighter plating of zinc die castings . . . with no anodic blackening and fewer rejects. *See booklet offered below.*

FREE For more information about the electrocleaning of steel, brass or zinc die castings, send for one or all of the booklets listed in the coupon.

four good steps toward better electroplating on steel
NEW
Good news about electrocleaning zinc-base die castings
OAKITE

Technical Service Representatives in Principal Cities of U.S. and Canada

OAKITE PRODUCTS, INC.
340 Rector Street, New York 6, N. Y.

Send me the free booklets I have checked below:

☐ "Four good steps toward better electroplating on steel"
☐ "What's NEW for electrocleaning brass and other copper alloys"
☐ "Good news about electrocleaning zinc-base die castings"

Name.....

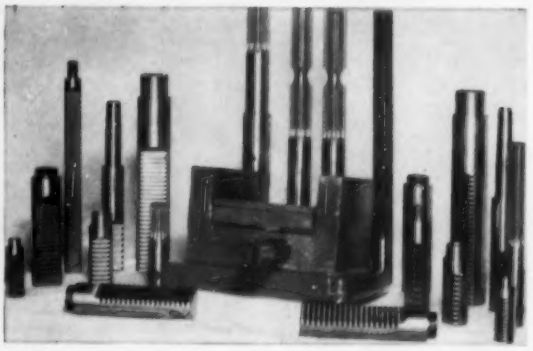
Company.....

Address.....

For more information circle No. 83 on the Reader Service Card

For more information circle No. 55 on the Reader Service Card

PEERLESS "FLAME-A-LOY"® PINIONS and RACKS
FOR DIE CASTING & PERMANENT MOLDS



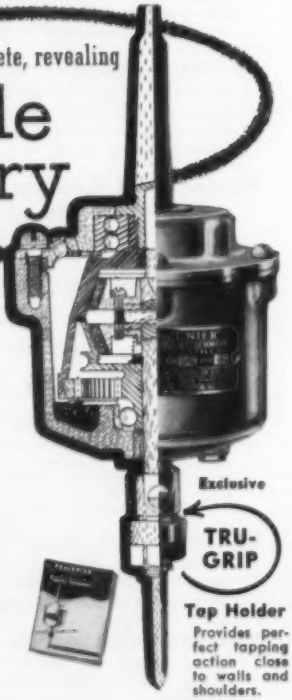
Standardized To Mate and Interchange With Each Other For Longer Wear At Less Cost.

—We Welcome Your Inquiries—

PEERLESS GEAR & MACHINE CO.

320 N. WESTWOOD AVENUE
TOLEDO 7, OHIO
Precision Products Since 1921
*Trademark Registered

Get the complete, revealing
Inside Story



on the finest tapping heads ever made!

A complete feature analysis on the amazing Procunier Tapping Line is yours for the asking! Gives a true "peephole" story on the many outstanding construction improvements, the mechanical advancements and precision quality operating advantages that make Procunier heads a "must" in production plants everywhere! You'll learn why Procunier means more tapping hours with minimum "down-time", faster production with fewer broken taps, fewer spoiled pieces and a "new-found" operating ease that helps operators maintain stepped-up production schedules. Find out how you, too, can benefit with Procunier in your plant.

Write For FREE Brochure!

Exclusive **TRU-GRIP** Tap Holder
Provides perfect tapping action close to walls and shoulders.

PROCUNIER SAFETY CHUCK COMPANY
14-16 S. CLINTON ST., DEPT. 3 **CHICAGO 6, ILL.**

For more information circle No. 85 on the Reader Service Card

USEFUL LITERATURE

Continued from page 63

Corrosion Protection: 184
The Chromalloy Corp. has published a four page reprint describing the Chromalloy process for corrosion resistance and heat protection.

Wire Thread Inserts: 185
Heli-Coil Corp. has a new "Design Manual & Catalog" (bulletin 625 A) that gives basic design data for the use of wire thread inserts and lists the standard types and sizes available.

Metal Finishing Systems: 186
Despatch Oven Co. has issued a 16 page color bulletin on finishing systems for metals. The bulletin gives numerous examples of Despatch installations and lists suggested methods of faster finishing.

Cutting & Coloring Buffs: 187
Hanson-Van Winkle-Munning Co. has a new 12 page bulletin describing its complete line of buffs for cutting and coloring.

Solvent Detergents: 188
Oakite Products, Inc. has revised its booklet on solvent detergents. The materials described combine the oil and carbon dissolving abilities of solvents with the penetrating, wetting-out and water rinsing qualities of surface active agents.

Waste Treatment: 189
Graver Water Conditioning Co. has issued a reprint (Technical Reprint T-143) on plating room waste treatment and chrome recovery.

Check and Compare!

NO OTHER LINE OF BARREL FINISHING EQUIPMENT OFFERS SO MANY EXTRA FEATURES

Take a minute . . . check SPEED-D-BURR *extra* features against your present finishing equipment—or compare with equipment you plan to install. No question about it . . . the total equals *more* dollar value when you buy—SPEED-D-BURR!!

36" x 32" BARREL UNIT

STANDARD EQUIPMENT	SPEED-D-BURR	[illegible]	[illegible]	[illegible]	[illegible]
BARREL CAPACITY					
BARRELS	Yes	Yes	Yes	Yes	Yes
HINGED BARREL DOOR	Yes	No	No	No	No
DRIVE ACTING CAM LOCKS	Yes	Yes	Yes	Yes	No
MODERN, STREAMLINED CABINET	Yes	Yes	Yes	No	No
CABINET PANELS	Yes	No	No	No	No
COLOR ENGINEERED CABINET	Yes	No	No	No	No
DOORS SIDEMOUNTED AND COVERED FOR PROTECTION	Yes	No	Yes	No	No
VARI-SPEED MOTOR	Yes	No	No	No	No
LOW VOLTAGE CONTROLS RECESSED AND SIDE MOUNTED FOR SAFETY	Yes	No	Yes	No	No
PRESET STOP AND START TIMER	Yes	No	No	No	No
DIRECT READING TACHOMETER	Yes	No	Yes	No	No
POSITIVE STATIC BRAKE	Yes	No	No	No	No

TOTAL—*More dollar value with* SPEED-D-BURR!

THE **FUTURAMA** SERIES
Custom Styled for **MODERN INDUSTRY**

SPEED-D-BURR CORPORATION — PRECISION BARREL FINISHING — MT-52

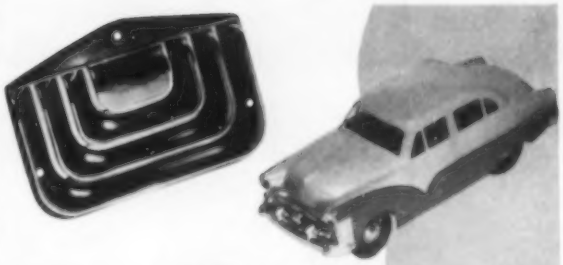
THE WORLD'S MOST COMPLETE LINE OF PRECISION BARREL FINISHING EQUIPMENT & SUPPLIES

Write for catalogs on:
SPACE MISER
FUTURAMA LINE
MITY-MITE LINE
HANDLING EQUIPMENT
MEDIA AND COMPOUNDS

Service is our most important product . . . Use it!

SPEED-D-BURR CORPORATION
3613-A San Fernando Road, Glendale 4, Calif.

For more information circle No. 87 on the Reader Service Card



FIORE MASKS FOR PRECISION PAINTING

Spray decorating methods have improved so rapidly in recent years that you may not be aware of some time-saving, money-saving techniques now available. Today, special Fiore designed spray masks and fixture devices make possible single or multi-color decoration with precise registration on irregularly contoured products.

IF { your product is judged on appearance / you want best possible results / you want a minimum of rejections } CONSULT US

Send for your FREE copy of our 20-page book which shows the different types of masks and gives case-study illustrations of their use. Or send your samples and drawings for consultation and estimates.

WM. M. FIORE INC.
269 41st Street — Brooklyn 32, New York

For more information circle No. 75 on the Reader Service Card

ask the man on the production line . . .

"I want P-K® self-tapping screws . . . I make more money with 'em!"

TV production line at Motorola, Inc., Chicago, Illinois

He does! You do, too!

Pay a man on a unit basis and he wants only the fastener that speeds production and eliminates rejects. That's why P-K Self-tapping Screws are preferred by men on the assembly line. They know through actual use that Parker-Kalon Self-tapping Screws are headed, threaded, pointed and hardened to keep assembly lines trouble-free!

Men in charge of production are P-K boosters, too. They know that the cost of the fastener is a fraction of the cost of using that fastener on the line—that P-K screws are actually the most economical. That's why the men who are responsible for production specify Parker-Kalon. They know . . . if it's P-K, it's O.K.

Sold Everywhere Through Leading Industrial Distributors. Warehouse In Chicago, Ill.

PARKER-KALON® *fasteners*

PARKER-KALON DIVISION · GENERAL AMERICAN TRANSPORTATION CORPORATION · CLIFTON, NEW JERSEY

For more information circle No. 84 on the Reader Service Card

PALNUT MOVES

The Palnut Co., manufacturers of lock nuts and fasteners, have moved to their new plant recently completed on an 11 acre tract on Glen Road, Mountainside, N. J., doubling the capacity of the plant facilities formerly occupied in Irvington, N. J.

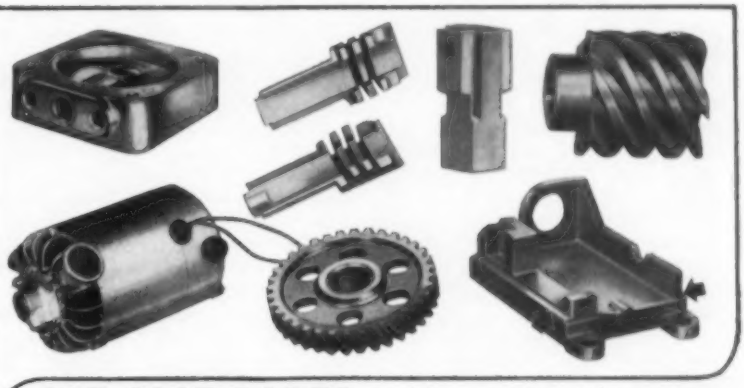
SHELL MOLD
continued from page 43

Gray's objectives could have been met by die casting except that the company still hesitated to incur the heavy initial costs this process involved. Because the number of units they expected to sell was not much greater than the number needed to amortize the die cost at the per-casting price they had established, they wanted to be sure sales would come up to expectations.

We had been using the shell mold process for casting aluminum, and we pride ourselves on our knowledge of magnesium. So we felt certain that we could cast magnesium in shell molds give Gray the kind of castings they needed at an attractive price.

Continued next page

For more information circle No. 49 on the Reader Service Card



DIE CAST PARTS *to Your Specifications*

A pioneer in the die casting art, *Milwaukee* has long been a recognized leader in supplying *Die Castings as Specified* to all types of industry for all types of products from small precision instruments to massive heavy duty machinery. That is why you can entrust *Milwaukee* to produce die cast parts to your most exacting specifications — not only in dimensions — but in contour, weight, strength, pressure resistance, wear resistance, finish and other vital characteristics.

We Operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

MILWAUKEE DIE CASTING COMPANY
4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN
Established 1909

New Pangborn Hydro-Finish

solves such cleaning problems as:

- ✶ deburring
- ✶ surface finishing
- ✶ finishing threaded sections
- ✶ improving cutting tool life
- ✶ maintaining dies and molds
- ✶ removing grinding lines
- ✶ removing heat treat scale
- ✶ preparing surfaces

Pangborn has redesigned the Hydro-Finish for added efficiency and easier handling. *Originating the use of air jet sluriators to eliminate pumps,* the new Hydro-Finish represents a lower investment as well as a lower maintenance cost. Optional equipment simplifies overall operation. Investigate Pangborn Hydro-Finish now!

For full details, send for Bulletin 1403, now! Write to: PANGBORN CORPORATION, 3500 Pangborn Boulevard, Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Pangborn
BLAST CLEANS CHEAPER

For more information circle No. 90 on the Reader Service Card

The pick-up arm is 15 inches long, 2½ inches wide at the back or counterweighted end, and has a 3/32-inch wall thickness on top and sides. There is a 1-inch-wide, 1/16-inch-thick reinforcing strip that extends the entire length of the arm, and there are three ribs that add rigidity to dampen or prevent resonance. Back of the pivot hole a thick-metal section is provided for counterweighting. The entire arm, as cast, before cartridge and stylus are added, weighs approximately 9 ounces.

We made our plates for shell molding using aluminum for the pattern (we have since standardized on cast iron) and made a few test molds and casts. This pattern is made three up and employs our own ideas of gating. We use a form of direct-flow gating that enables us to cast in greater multiples than most foundries care to attempt.

Because of the many sharp variations in wall thickness caused by the ribs, the gating gave us trouble and necessitated several changes before we obtained a satisfactory metal flow. Then we found that we had trouble with the surface. Magnesium oxidizes readily when molten and there was enough oxygen present in the mold to cause surface burning. So we had to experiment with kinds and amounts of inhibitors to stop this oxidization. We settled on 1% of ammonia fluoroborate per 100 pounds of molding sand and have found this formula satisfactory ever since.

The 14 x 18 Shalco shell molding machine we use was selected after careful study of all available equipment. The precise control of temperature is very important in forming shells. Heating irregularities are mainly responsible for the sticking of shells to the plates. Sticking is the bugaboo of the shell molding process. We feel that the Shalco principle of incorporating heating elements in the plates themselves gives the most uniform temperature. We operate at 400 F. and use a 25-second heating cycle for forming the shell on the plate. The heating oven is then rolled into position over the "raw" shell to bake it another 45 seconds at 400 F.

We have now been casting the Gray hi-fi pick-up arms over a period of nearly a year and have produced several thousands of them.

The success of these castings has enabled Gray to reduce the price of the product by about 40 percent. This, in turn, has led to greatly increased sales, so that now the company feels justified in taking the next logical step, a shift to die casting for lower unit cost and finer finish.

While we naturally regret that our very success causes us to lose future orders for this part, we are glad that we have learned how to shell mold cast magnesium. Other manufacturers may now find that, through this process, the possibilities for taking advantage of magnesium's light weight, high strength, and other desirable characteristics are greatly increased.

The Case Of The High Heels

For the second example of shell mold casting applied to magnesium, take the case of magnesium heels for ladies shoes. These heels have been made almost exclusively of wood for many, many years. Attempts to use other materials, particularly aluminum, have not met with much success.

Late last year an independent production tooling adviser, working with the Delman Company on ways to produce a new ultra-slim French heel, decided it had to be magnesium. Robert Klein, the tooling adviser, brought his problem to us to help him develop a cast magnesium heel. Klein had determined that the

Bellows
COLLET CONTROLLER

low-cost automatic stock-holding for hollow-spindle lathes and other rotating spindle machines.

★ never stop the machine
★ stock will NOT Slip
★ operate manually or automatically

Take a critical look at your methods of loading and holding work. Are they eating into profit margins by robbing you of valuable machine time? The fractions of seconds wasted while stock is positioned, while collets and holding fixtures are set and reset, total up to an alarming theft of productivity.

The Bellows Collet Controller, powered by a special aluminum non-rotating air cylinder, opens and closes collets faster than the eye can follow. It can be pushbutton controlled or interlocked with other machine elements for automatic operation. The spindle motor of the machine need never be stopped. Holding pressures are always uniform (25 times air pressure applied). Clamping is instantaneous and positive. Mounting is easy. And cost is low.

FOR FULL INFORMATION
Write for
ADDRESS DEPT. PMM 356
BULLETIN BC-60

The Bellows Co.
AKRON 9, OHIO
CONTROLLED-AIR-POWER FOR FASTER, SAFER, BETTER PRODUCTION

For more information circle No. 73 on the Reader Service Card

heels would need to have the density of sand castings but that the finish imparted by die casting would be desirable.

The Delman company was in a hurry. It needed a few thousand pairs of heels on short order for shoes already made and awaiting only the heels. By sand casting we could get them out in time, and did. The cast magnesium heels have passed all tests thus far and are now undergoing the final test of customer use. No one sees any reason to think they will be other than wholly satisfactory. Other shoe manufacturers are convinced that the cast magnesium heels are here to stay.

Now we are preparing to go into shell molding to produce both standard and special high heels for two other shoe companies and are negotiating with several more. With the shell mold process we can produce heels at approximately half the cost of the two-piece wooden heels formerly used. Magnesium heels have a sheer strength and wear far in excess of wooden heels, and the magnesium also has a slight, rubber-like resilience that gives what the trade calls a "live walk"—a very desirable quality.

There is no appreciable difference in the density of castings made by shell molding as compared with sand castings. Shell molding gives a somewhat finer microfinish and yields castings that are generally more uniform than sand castings. The heels are used as cast, except for the drilling and tapping of holes for attaching a lift and for fastening the heel to the shoe. As with wooden heels, the magnesium heels get coverings of fabric, leather, or lacquer.

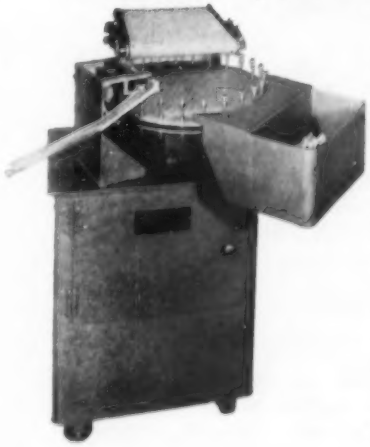
Dow AZ91C has been found to be the best alloy for these heels. We cast them 14 up from match plates in the sand process and will use the same alloy and the same multiple in shell molding.

Aside from the usual problems of minor redesign to eliminate uncastable details and those of gating, etc., to get proper metal flow, the heels have presented only one difficulty. We had to devise an unusual heat treatment to overcome a slight tendency for the ultra-slim heels to fracture when subjected to severe sheering stress. As now delivered, these heels will bend before they can be made to fracture.

Don't LET OLD FASHIONED, OBSOLETE METHODS STEAL YOUR PROFITS!
Cut finishing costs. Greatly increase production with Conforming Matrix spray masks, fixtures, automatic machines and mask washers. Send prints or sample parts, giving production requirements and results desired. Recommendations as to the most efficient technique for handling your particular requirements incur no obligation.
MASK WASHING MACHINES
50% faster than any other make. Cut solvent consumption. Avert production delays due to damaging of masks by hand scrubbing.
PRODUCT DEVELOPMENTS BY CONFORMING MATRIX
CM
SPRAY PAINTING MASKS
A competent engineering staff will counsel with you on the most efficient technique for handling your particular requirements.
CLAMPS AND FIXTURES
Positive pressure and exact registration of the part in the mask. Reduce rejects. Free both hands for productive movements.

Automatic machines permit increased production rates in intricate spray mask decoration, by as much as hundreds to one, over hand methods. Radically reduce labor costs and eliminate the need of experienced workmen. Rejects, common with careless or inexperienced hand spraying, are practically eliminated. Conforming Matrix builds a number of very flexible automatic machines, each can be manufactured to meet your specific requirements.

AUTOMATIC ROTARY WIPING MACHINE MODEL DW24RT



for high-production wiping of excess paint from stove, heater, and refrigerator knobs, etc., after mask-controlled spraying which holds the paint to the immediate area.

Greatly increases production over the old-fashioned method of hand wiping after spraying or dipping.

The speed of spindle travel is adjustable from 700 to 3600 wiped pieces per hour. The operator can sit at the machine and feed from the hopper. The parts move under the wiping cloth, are revolved until they are wiped clean, and then removed from the spindle by the unloading device.

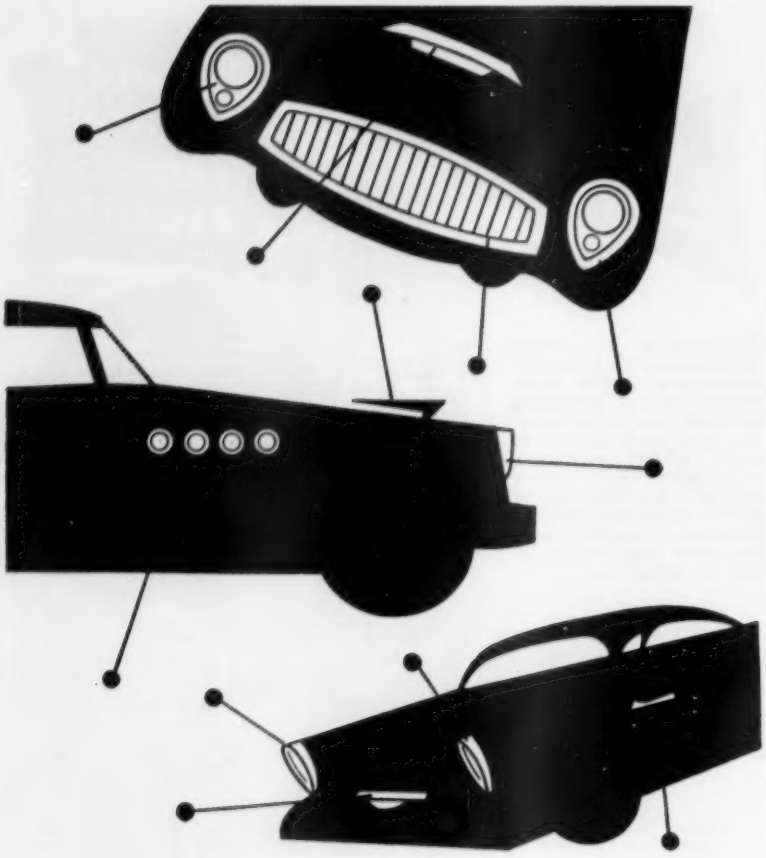
The machine takes up less than 5 sq. ft. of floor space and is motivated by a ¼ H.P. explosion-proof motor. It is mounted on casters for ready portability.

CONFORMING MATRIX CORPORATION

346 TOLEDO FACTORIES BUILDING — TOLEDO 2, OHIO

Please send without obligation, details on
.... Masks; .... Fixtures; .... Mask Washing Machines; .... Automatic Machines.

NAME .....
FIRM .....
STREET .....
CITY AND STATE .....



Better ZINC DIE CASTINGS from this engineered metal

A product of Federated research, Di-METAL is a zinc-base die-casting alloy of unusual purity. Three grades are available to assure you of the exact characteristics you want.

Produced under rigid quality control, Di-METAL is made only of metals of the highest quality. The zinc base is 99.99+% pure; only commercially pure aluminum, magnesium and electrolytic copper are added. Inspection follows every phase of the alloying process to guard against impurities. For example, in the specifications the allowable lead content is 0.007 percent; but a Federated Di-METAL ingot contains .003 percent or less, giving the die caster an extra margin of safety.

Let Federated sales engineers help you get better die castings of any metal. A suitable alloy is available or can be engineered to your precise specifications. Call any of our 13 plants or 23 sales offices across the country.

Federated Metals

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Aluminum, Anodes, Babbitts, Brass, Bronze, Die Casting Metals, Lead and Lead Products, Magnesium, Solders, Type Metals, Zinc Dust

For more information circle No. 28 on the Reader Service Card

ADDS "LOST WAX" AND SHELL MOLD DEPARTMENTS

The establishment of new departments for wax investment casting and shell molding operations by the Alloy Precision Castings Company, Cleveland, Ohio has been announced by Frank W. Glaser, executive vice president and general manager.

The Alloy Precision Castings Company, a subsidiary of Mercast Corp. of New York, is a producer of mercury investment castings based on the Mercast Process.

QUALITY CONTROL
continued from page 37

are discussed below with reference to an ethyl silicate binder.

One of the most important variables is gelation time. The packing rate of the investment, and the investment temperature, are additional variables in the investing process. The effect of gelation time on mold strength is shown in Figure 1, with green mold strength plotted against the gelation time. The curves indicate the behavior the foundry might encounter in using two different investments. For investment A, the mold strength

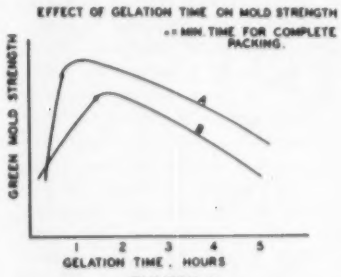


FIGURE 1

increases rapidly with increased gelation time up to the time of complete packing, which occurs in approximately one-half hour. It continues to rise to a maximum at a gelation time of one hour and then drops off gradually. For investment B, the green mold strength again increases sharply to the minimum packing time of about 55 minutes, although not as rapidly as for investment A. It rises to a maximum at about an hour and a half and then drops a little more rapidly than Curve A with increasing gelation time.

For investment A to obtain the best range of green strength, it is desirable to control the gelation time between 45 and 90 minutes;

and for investment B, the desirable range occurs between 75 and 120 minutes. These limits are important to obtain the best green mold strength for the particular investments. If premature gelation occurs (that is, before complete packing), a mold of low density will result. Castings in this prematurely jelled mold will actually be longer because of the excessive expansion of the investment. In addition, this mold will be of low strength, will probably crack, and result in fins and dirt on the casting.

Gelation control is maintained by running a test sample on each batch of investment binder prior to its use in production. Necessary adjustments in the binder can thus be made before any molds are invested.

The temperature of the investment material is also of importance in determining the quality of the casting. In Figure 2, the effect of temperature on gelation time is shown for three different binders. For example, if binder B were used and a gelation time from 1 to 1½ hours were desired, it would be necessary to operate in a temperature range of 60 to 70 F. If the temperature rose to 80 F, the gelation would occur in about 35 minutes. This short gelation time would probably result in a poorly packed, low-strength mold.

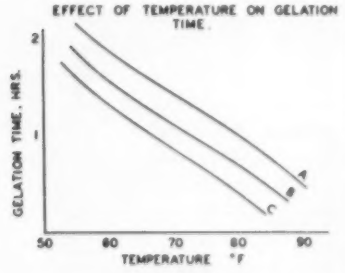
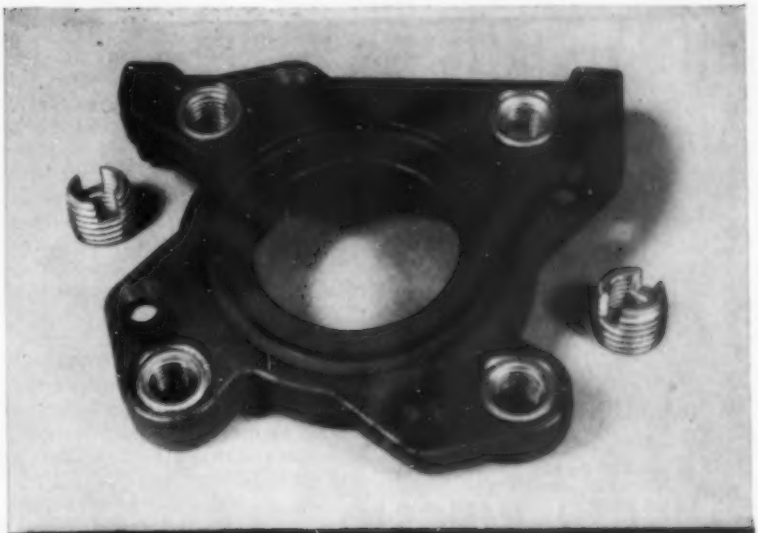
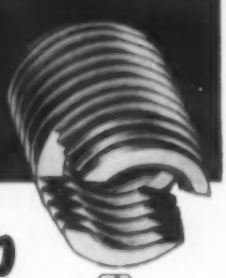


FIGURE 2.

It is often impossible to correct for temperature variation by changing the binder composition. It is desirable therefore to control the temperature of the materials and the investing area so that such variations do not occur. This temperature should be nearly the same as that maintained in the wax and dip-coating areas. A temperature change between these areas can thermal-shock the dip-coated assemblies during the investing operation. This thermal shock would crack and spall the dip



TAP-LOK® INSERTS



put a steel grip in die castings

TAP-LOK Inserts are applied successfully in the die cast aluminum plate diaphragm retainer of a gate valve . . . (pictured above). 7/16" diameter holes are provided for four short series 5/16-24 steel Tap-Lok Inserts.

Tap-Lok Inserts are hard threaded steel bushings which increase the thread strength of non-ferrous metals, plastics and other relatively soft materials. They are self-tapping and friction-locking in a single operation . . . can be quickly and easily installed even by unskilled labor . . . eliminate tedious hole preparation and secondary operations.

Designed primarily for original equipment installation, they are also widely used for salvage and thread repair.

Send for additional information.

Also manufacturers of Groov-Pins for positive locking press fit.

GROOV-PIN CORPORATION

1122 Hendricks Causeway Ridgefield, New Jersey

For more information circle No. 77 on the Reader Service Card

READ THIS

and increase your die casting machine production

Precision

UN-BREAKABLE
tempered and treated stainless steel die casting

PLUNGER RINGS

give up to

8 to 10 TIMES
THE AVERAGE LIFE
of
Die Casting Plunger Rings

Name the largest die casters and you will have the users of Precision Un-Breakable Tempered and Treated Stainless Steel Die Casting Plunger Rings. The reasons are many . . . here are a few:

1. Precision Die Casting Rings are wrought, **not cast**, from dense, fine grain, flawless stainless steel.
2. They are formed to have uniform tension throughout the entire circumference.
3. They have flexibility and resiliency . . . yet withstand excessive temperatures without collapsing.
4. Special heat treatment processes give Rockwell C-48-55 hardness, yet . . . rings remain un-breakable.
5. Precision Rings are available specifically for die casting machines in various widths to suit your present and proposed plunger grooves.
6. They are engineered to let the ring take the load of sealing and maintaining pressure.

Precision's Engineering Department can solve your problems on die casting . . . increase machine productivity through longer ring life . . . reduce rejections and operating costs.

Write today for our recommendations on rings for your die casting plungers.

Precision
PISTON RINGS, Inc.

Sales Offices: INDIANAPOLIS—CHICAGO—
LOS ANGELES—SAN FRANCISCO—
NEW YORK—PHILADELPHIA

Circle No. 57 on the Reader Service Card

coat, resulting in casting imperfections.

The major variables in the casting operation are listed in Table 3. The mold preheat temperature determines the amount of mold expansion. Too low or too high temperature results in castings that are undersized or oversized, respectively. Also, the preheat temperature determines the solidification rate of the metal in the mold. Improper preheat temperatures therefore can result in unsound castings because of internal shrinkage. To avoid this shrinkage the furnace preheat temperature should be regulated by means of recording temperature controllers within a range of 25 F.

The second variable of major importance in the casting operation is the pouring temperature of the metal. With too low a pouring temperature, the mold cavity does not fill. With too high a pouring temperature, excessive washing of the melting crucible and the mold cavity can occur and as a result slag inclusions get into the casting.

For small melting units up to 15 pounds, the control of metal pouring temperature can be

ON EVERY POROUS CASTING
THROUGH
WASTED MATERIALS
ASSEMBLY COSTS
MACHINING TIME
PRODUCTION LAGS

WESECO Impregnant P. E. #1 will increase your profits by eliminating **all porosity** in your castings. Plants in all principal cities. Send for brochure #19.

WESTERN SEALANT COMPANY
9999 WEST JEFFERSON BOULEVARD
CULVER CITY, CALIFORNIA

Circle No. 89 on the Reader Service Card

The abbot and the Bishop's Candlesticks

The Bishop was upset. How could he possibly have 500 dull, tarnished brass candlesticks polished and gleaming in time for tomorrow's special candlelight services?

The *abbot* was quite calm. He *knew* the answer to the Bishop's dilemma and in less than twenty-four hours, he returned from his laboratory with the candlesticks — bright and glistening.

How did he do it?

Articles made of brass and other metals may be readily burnished and tumbled with Abbott Burnishing Materials. Made in six scientifically designed shapes, Abbott Burnishing Materials make efficient and uniform contact on metal parts and castings of every conceivable size and shape. Economical to use, they are *deep hardened* and have a mirrorlike glass-hard surface for extra long life. Combined with the Abbott Vertical Tumbling Barrel, they make the perfect barrel finishing combination.

If you have a special barrel finishing problem, let the abbot help you solve it. Just write us.

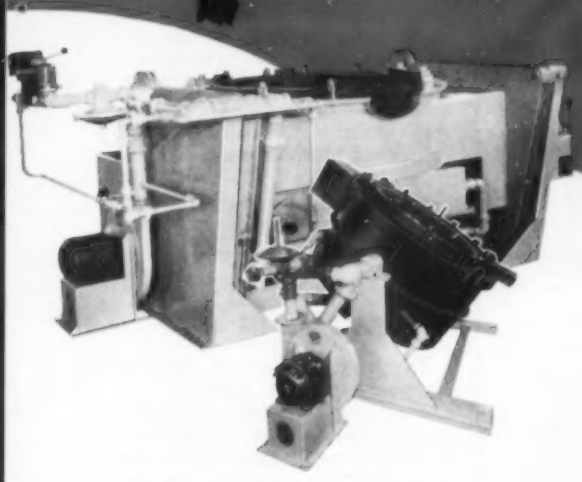
ABBOTT

The ABBOTT BALL Company
1084 New Britain Avenue
Hartford 10, Conn.

Circle No. 70 on the Reader Service Card

Get Perfect Pours at Lower Costs WITH Faster STROMAN FURNACES

Yes sir, you can bank on Stroman Foundry Equipment to deliver metal the way you want it, when you want it, everytime . . . for Stroman are the leaders in design of metal melting furnaces and equipment. For many years they have set the pace in the field, producing the finest furnaces that have effected tremendous economies for foundries, die caster, sand caster and permanent mold plants. They can do the same for you. Get full information . . . write for NEW Bulletin 900 today!



STROMAN TYPE "NL" FURNACES

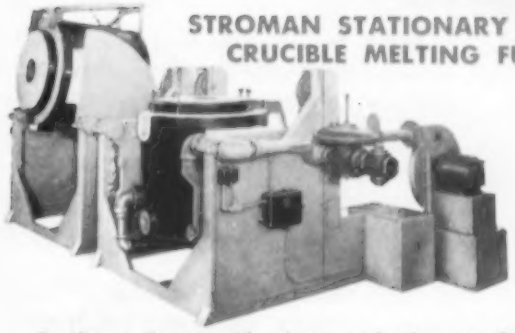
For Aluminum, Zinc, Lead, Kirksite and other Soft Metals.

These furnaces have many uses and are particularly efficient when large pieces of metal or bulky scrap is to be remelted. The iron pots have a large diameter and a comparatively shallow bath. Available in choice of Hand Tilt or Hydraulic Tilt with Stationary Lip Pour.

STROMAN LARGE SIZE REVERBERATORY FURNACES

For melting unlimited capacities of Aluminum, Zinc or Brass.

Excellent for Smelting, Extrusion Work, Die Casting, Permanent Mold and Foundry Melting. Built to meet your particular melting problem. Now in use in many of the largest manufacturers of castings.



STROMAN STATIONARY LIP POUR CRUCIBLE MELTING FURNACE

For Brass, Bronze, Aluminum and other non-ferrous metals. Capacities from No. 60 to No. 1000 Crucible.

These furnaces with Stationary Lip Pour that assures a constant pouring arc meet specific needs in handling various metals for the foundry, permanent mold, die casting plants and rolling mill. It is ideal for use with monorail or dolly ladle for large quantities of metal. Eliminates spillage and waste.

STROMAN CRUCIBLE STATIONARY MELTING FURNACES

For Brass, Bronze, Aluminum and other non-ferrous metals. Sturdy, efficient and featuring the Stroman Push-Back Cover these stationary furnaces are designed for peak production and greatest fuel economy. Oil or Gas Fire. Capacities from No. 20 to No. 400 crucible.

STROMAN FOUNDRY EQUIPMENT

• Oil Burners

For ordinary or extremely high temperatures. A type built for every purpose.

• Centrifugal Blowers

Precision fabricated to deliver combustion air in any desired pressure or volume.

• Oil Pumping Units

Come complete, ready to hook into your heating system. Fool proof in operation.

Write for NEW CATALOG 900
just off the press!
All New Equipment. Do it now!

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF THE PETERSEN OVEN CO. • FRANKLIN PARK, ILL.

For more information circle No. 64 on the Reader Service Card

Mossberg had 5 REASONS for using . . .

4 HITCHINER INVESTMENT CASTINGS in this new shotgun*. . .

1. PRICE: These four intricately shaped parts could not be machined within cost budgets. HITCHINER Investment Castings were well within the budget allowed.

2. STRENGTH: If machined, choice of metals was limited to those easily worked. HITCHINER Investment Castings requiring little or no machining, offered a wide variety of alloys permitting greater strength at no additional cost.

3. TIME: Production speed was essential in introducing the new gun. HITCHINER, by using comparatively inexpensive one-cavity dies for the original run, helped get the gun on the market on schedule. Later, multiple-cavity dies were used.

4. DESIGN: The four key parts as designed posed difficult manufacturing problems. The HITCHINER Investment Casting process permitted wide latitude in contour and form.

5. APPEARANCE: Obviously components must maintain the appearance of quality in any quality product. HITCHINER produced accurate parts attractive in appearance without extra work or cost.

These are reasons why so many use HITCHINER Investment Castings to solve small parts problems in both small and large production runs . . . send us your drawings and all pertinent data.

A 12 page booklet covering cost, design, application and manufacture of HITCHINER Investment Castings is yours for the asking . . . send for it TODAY.

*The gun is one of the new No. 200 series Pump Action Shotguns manufactured by O. F. Mossberg and Sons, Inc., 998 St. John's St., New Haven 5, Connecticut.

HITCHINER
Manufacturing Company
MILFORD 7, NEW HAMPSHIRE
REPRESENTATIVES IN PRINCIPAL CITIES

For more information circle No. 33 on the Reader Service Card

maintained by means of recording radiation pyrometers. The desired pouring temperature is set on the recorder, and the casting furnace operator determines the proper temperature levels by means of a series of control lights. This system allows a regulation of the pouring temperature within a range of 25 F on the instrument. In addition to accuracy, it allows for speed of operation so that the metal can be checked quickly for temperature and can be poured in a minimum of time. Each pyrometer should be checked for calibration against an immersion thermocouple once every 24 hours.

Cleaning and Finishing

The type and size of abrasive material used in cleaning the casting are important, since the surface finish of the casting is to a large extent dependent on the abrasive. For example, an increase of 10 mesh in the size of the sand used in blasting can result in a 50-point increase in the RMS rating of the surface. Blast pressures are also important in the cleaning operations. High blast pressure can, for example, cause excessive erosion that will alter dimensions.

The finishing operation presents a problem in controlling surface finish and dimensions. Too coarse an abrasive will result in the removal of an excessive amount of material and thus in undersized castings. Coarse abrasives may also result in poor surface finish. To some extent, the surface quality of the castings will determine the type of abrasive to be employed. As a general rule for best dimensional control, the finest abrasive which will finish the part in a reasonable time should be employed.

The quality of the cleaning and finishing operations is controlled by the subsequent gauging and inspection of the castings. A close liaison between finishing and inspection departments must be maintained to prevent any overgrinding or excessively rough surface finish.

Some of the variables which require control by the foundry and how they may affect the quality of the casting have been discussed. Other important variables which must be controlled are the quality and type of raw materials.

DATA IN ADS
continued from page 28

71. SURFACE FINISHING of light metal parts is thoroughly discussed in technical publications of Allied Research Products Co.

73. AIR CONTROLLED COLLETS can speed up work and lower operator fatigue. These control units are discussed in bulletin BC-60 from The Bellows Co.

75. SPRAY MASKS, their design, construction and use are all covered in a 20 page booklet that has been compiled by Wm. M. Fiore, Inc.

77. THREADED INSERTS increase the thread strength in non-ferrous metals. These hardened steel inserts are completely covered in data sheets from Groov-Pin Corp.

78. DRILLING & TAPPING HEADS for building up special machines or for single drilling and tapping operations are described and engineering data given in literature from Ettco Tool Co., Inc.

79. ORGANIC FINISHES for die castings, either standard types or specials are covered in literature from Maas & Waldstein Co. The latest Plextone finish is specifically covered.

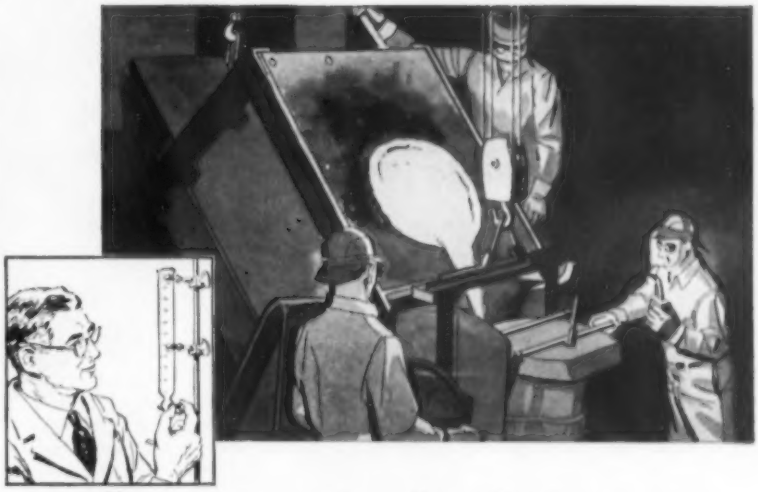
80. BARREL FINISHING COMPOUNDS of the "Honite" type are discussed in a booklet that has been prepared by Minnesota Mining & Mfg. Co.

81. MACHINE DEBURRING of elliptical holes and inaccessible hole faces is covered in new literature from the Nobur Mfg. Co.

83. METAL CLEANING is essential prior to either shipment or surface finishing. The various materials and methods to use for a wide variety of metals is covered in booklets from Oakite Products, Inc.

87. BARREL FINISHING can be the best and most economical method of handling small parts. Speed-D-Burr Corp. has prepared a catalog of the various units they manufacture.

89. SEALANTS FOR POROUS CASTINGS can often reclaim parts that would otherwise have to be scrapped. Brochure No. 19 from Western Sealant Co. describes the process and available materials.



It pays to insist on

MASTERMET CERTIFIED ALLOYS

STAINLESS • HIGH TEMPERATURE • SPECIAL ANALYSIS

Make Cannon-Muskegon your source of custom and standard high alloy metals — and be sure of exactly predictable metallurgical control

NO matter what alloys you use, it pays to have the exact physical, chemical and electrical characteristics you want. That's why the leading firms in your industry insist on MasterMet certified alloys. With each heat, you receive a notarized analysis as a guide for remelt or processing. And, close laboratory control assures constant uniformity to one or more heats of the same alloy.

Look into the great versatility of Cannon-Muskegon's complete MasterMet alloy service — and the opportunity it affords for improving present quality, for experimental or new production. MasterMet alloys are available in shot, ingots and cast billets, bars and special shapes.

Typical Regular-Production Alloys Certified for Scores of Applications

STAINLESS STEELS	SUPER ALLOYS	ALLOY STEELS	SPECIAL ALLOYS	
	High Temperature		*NI RESIST	CU-NI
300 SERIES	AMS 5382B	SAE 4130	*MONEL	NI-CR
400 SERIES	AMS 5385B	SAE 52100	*INCONEL	NI-FE
ACI TYPES	AMS 5388	SAE 6150	INVAR	CR-FE
17-4-PH†	PWA 651A	SAE 8630	TOOL and DIE STEELS	
		SAE 3140		

†ARMCO Steel Corp. *International Nickel Co.

Cannon-Muskegon
CORPORATION

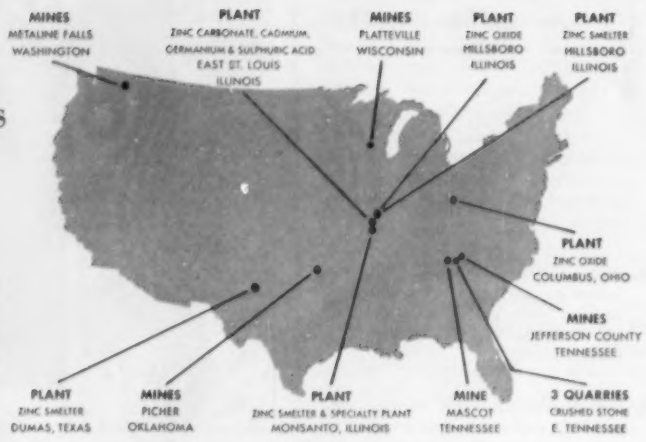
2871 LINCOLN STREET • MUSKEGON, MICHIGAN

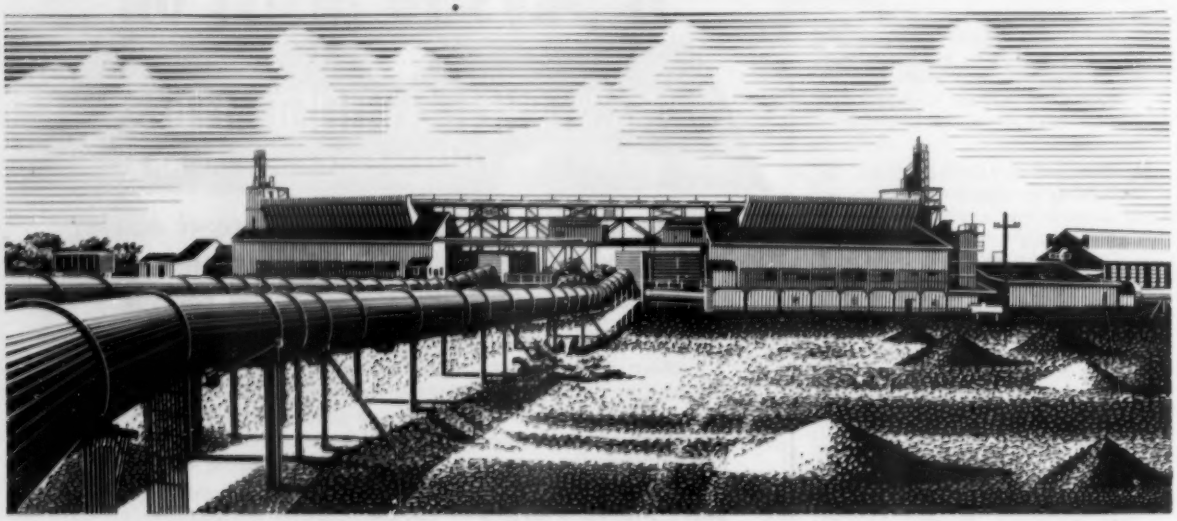
Cannon-Muskegon is your only source of MasterMet certified alloys — that's why it pays to have the complete story. Write for NEW catalog today.

MASTERMET
CERTIFIED ALLOYS FOR INDUSTRY

For more information circle No. 15 on the Reader Service Card

American Zinc and its products from A to Z





DUAL OPERATION AT HILLSBORO, ILLINOIS

(1) The Oxide Division supplies American process lead-free and leaded zinc oxide, as well as French process zinc oxide. (2) In the Metal Division, Prime Western, Select, Brass Special, Intermediate and High Grade slab zinc are produced. For complete picture of American Zinc operations, see map above.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

Distributors for

American Zinc sales Company

AMERICAN ZINC, LEAD & SMELTING COMPANY

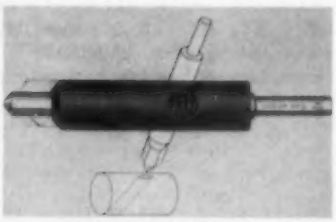
Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

For more information circle No. 6 on the Reader Service Card

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

PRODUCT NEWS AND DEVELOPMENTS

IRREGULARLY SHAPED HOLES NOW MACHINE DEBURRED



A newly designed tool for the deburring and chamfering of openly accessible hole faces having irregular surfaces has been announced.

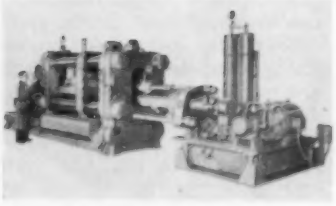
Elliptical surface holes are generated when a round hole is bored at an angle or into a cylindrical or spherical face. Since conventional deburring tools will not properly handle holes of the shape generated under these conditions it is usual to debur by hand using a rotary file or some similar tool.

The new tool is self-piloting and a two-lipped cutter automatically accommodates and follows the hole surface geometry. The pilot is conical to accommodate a wide range of hole sizes within a given range.

The cutter blade has two diametrically opposed cutting edges, and is supported so as to permit both radially displacement and axial displacement.

Nabur Mfg. Co.
For more information, circle No. 81 on the Reader Service Card

800-TON DIE CASTING MACHINE FOR LARGE ALUMINUM PARTS



A new 800 ton die casting machine, capable of producing large aluminum parts such as automotive grilles, transmission housings, motor blocks, outboard motor castings, etc. has been announced. Aluminum parts weighing up to 35 lbs. can be cast on the new machine.

The new cold chamber machine is said to be a new approach to die casting. A positive, self compensating mechanical link-wedge locks the clamp at the rated tonnage. No tie rod nut adjustment is required and push-button control provides central screw daylight and tonnage adjustment.

Die platens are 59″ x 55″ and the daylight opening is variable from 34″ to 16″. Control of stroke, slowdown, automatic cycling (including three core pull and ejector sequence) are all within the control of the operator.

The new machine features an independent injection end which permits ample open floor area for automatic ladling furnaces and other devices.

The Hydraulic Press Mfg. Co.
For more information, circle No. 207 on the Reader Service Card

HYDRAULIC HOBBING PRESSES IN CAPACITIES TO 5000 TONS

A completely new line of hobbing presses has recently been introduced. Capacities range from 100 to 5000 tons; all are power operated except the smallest which is normally supplied with a hand operated 2-stage pressure pump.

Special features of these presses include a hydraulic circuit that permits rapid closing, automatic change-over from high to low speed at contact between the hob and a die and a fine adjustment with low hobbing speeds.

Associated equipment allows the preselection of hobbing depth and hobbing pressures. Depth measurements may be made directly to a depth of 2″ with a precision of 0.001. Greater depths are measured and preset through the use of end measures.

The pre-selection of depth and pressures permits the exact duplication of cavities and complete protection of the hob.

Haller, Inc.
For more information, circle No. 206 on the Reader Service Card

More new products on next page

ALUMINUM REPLACES COPPER

. . . due to low-resistance coating

Due to the high electrical resistance of the oxide film formed on aluminum surfaces, aluminum for switch parts, bus bars, etc. has been greatly retarded.

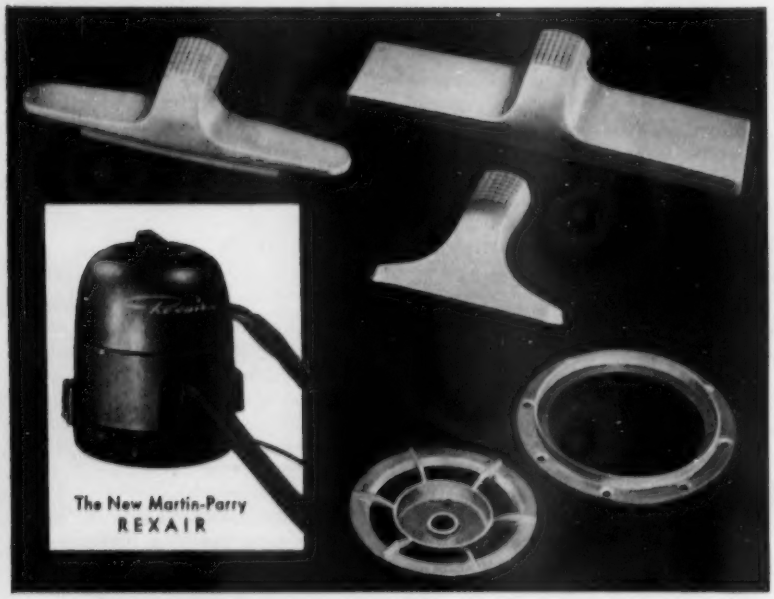
Now, according to one manufacturer of surface finishing preparations a process is available that forms a very low resistance surface film which inhibits formation of aluminum oxide and thus maintains the good electrical conductivity of aluminum across a mechanical joint.

The process is simple to use and the work may be treated in batch processes, or continuously by dip or spray. The amount of protection secured is dependant upon the time of treatment.

While a greater volume of aluminum is required than would be the case with copper, the lower weight and more rapid installation will generally result in a lower final cost for an installation.

Conversion Chemical Corp.
For more information, circle No. 208 on the Reader Service Card

Martin-Parry Corporation saves money and maintains quality with



ACCURATE Die Castings

■ To produce a better, lighter sweeper at lower cost, the Martin-Parry Corporation uses ACCURATE aluminum die castings. They were sure that each casting would meet their exacting specifications and that all commitments would be fulfilled. Here are a few advantages obtained from die castings:

- Light weight
- Smooth surfaces
- Dimensional accuracy
- High strength
- Low unit cost
- Laboratory controlled quality

Whenever your product requires castings, it will pay you to investigate the many cost-saving advantages of die castings and the qualifications of ACCURATE.

Write for brochure on facilities available.

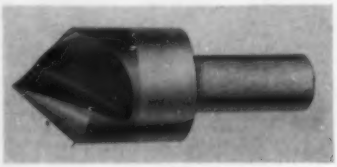
Major Producer of Aluminum, Zinc and Magnesium Die Castings

ACCURATE DIE CASTING CO.
3089 E. 80th STREET • CLEVELAND 4, OHIO

For more information circle No. 3 on the Reader Service Card

SINGLE FLUTE COUNTERSINK

. . . has solid carbide body



A single flute countersink with a solid carbide body has been developed. This tool is designed for use in production countersinking jobs; the carbide is effective in hard alloy steels up to a hardness of 65 Rockwell C.

It is presently available in 60, 82 and 90 degree angles in sizes ¼", ½", ¾" and 1" diameters. The two smaller sizes have ¼" shanks and the larger ones ½" shanks.

M. A. Ford Mfg. Co.
For more information, circle No. 210 on the Reader Service Card

CUTTING & COLORING COMPOUNDS

. . . developed for aluminum

New applications for cutting and coloring aluminum have been developed from the extensive line of bar and liquid buffing compounds manufactured by one of the metal finishing suppliers.

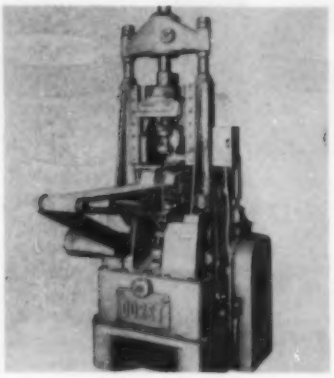
Liquid Compounds—Two liquid compounds, Liquid Tripoli 303 and 420, have proven most effective in heavy duty cutting applications, the company reports. These are now used extensively in the aluminum pot and pan industry.

The new Liquid Tripoli 728 provides excellent cut, while leaving the surface with a high clean color. This compound is particularly applicable to the appliance, storm window and automotive fields.

Bar Compounds—Several H-VW-M tripoli bar compounds meet specific requirements for cutting down aluminum, the company reports. These range from very greasy compounds for heavy duty operations to medium greasy for general purposes. For cut and color, a number of silica-type compounds are available. Where high color is a requisite, H-VW-M recommends several of its newly-developed aluminum oxide compounds, No. 6B-168, 6B-72 and 8390. Lime-type compounds are also available for this type of work.

Hanson-Van Winkle-Munning Co.
For more information, circle No. 212 on the Reader Service Card

AUTOMATIC POWDER PRESS
. . . in larger model

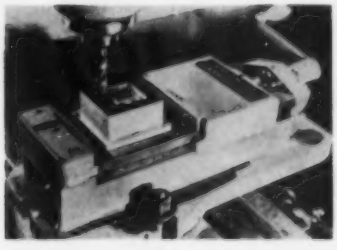


Originally available in only the 50 ton model, one of the newer presses specifically for compressing metal powders is now available in a 110 ton capacity. The new model is said to be completely automatic in operation.

Designed to produce from 4 to 20 pieces per minute, depending on the intricacies of the piece, this press is said to have a number of outstanding advantages such as micrometer adjustment of prepress movements, automatic fill, press and ejection, variable speed drive, and a pick-up and conveyor system for removing finished parts.

Arnold Ceramics, Inc.
For more information, circle No. 216 on the Reader Service Card

MACHINE HOLD-DOWN VISE
. . . for positive seating



Designed to pull work down to give more accurate seating, a new hold-down vise for use on machine tools is said to cut set-up time materially and reduce machining errors due to improper seating of parts in the vise.

The new tool has two hinged automatic pull-down jaws. In the open position the heels of the jaws rest on four spring-loaded buttons which hold the clamping surface of the jaws 1/32" above the clamped position. As the vice is tightened these jaws continue to hold the downward movement against the spring loaded buttons. This has the effect of rotating the jaws so that the tighter the work is clamped the more it is pulled down until it is firmly seated in the vise.

To prevent springing or buckling of the base, the clamping screw is half recessed into the base and on a direct line with the clamping position of the hold-down jaws. Further rigidity of the base is assured by designing it with a shallow depth.

Illinois Metal Products
For more information, circle No. 215 on the Reader Service Card

BRAIDED HOSE
. . . for general use

A new, reportedly advanced type of all-purpose hose has been announced. The hose is said to be suitable for use with air, oil, water and mild chemicals. Among the eight advantages claimed for this hose are extremely long life and non-kinking. The hose is mandrel-made, horizontal braided construction.

Raybestos Manhattan, Inc.
For more information, circle No. 214 on the Reader Service Card

Continued on page 81

here's how **HENNING**
helps your new products
take shape
from ZAMAK
die casting alloys

From ingots of Henning Zamak die casting alloys come products impossible heretofore. They permit unlimited design latitude for new products because they can be used in the filling out of fine detail and of thin sections, as well as the production of good surface texture. All are specifically made to meet the most precise needs at lowest cost.

Send today for fact-filled, pocket-size booklet to find out how Zamak alloys can meet your needs exactly.

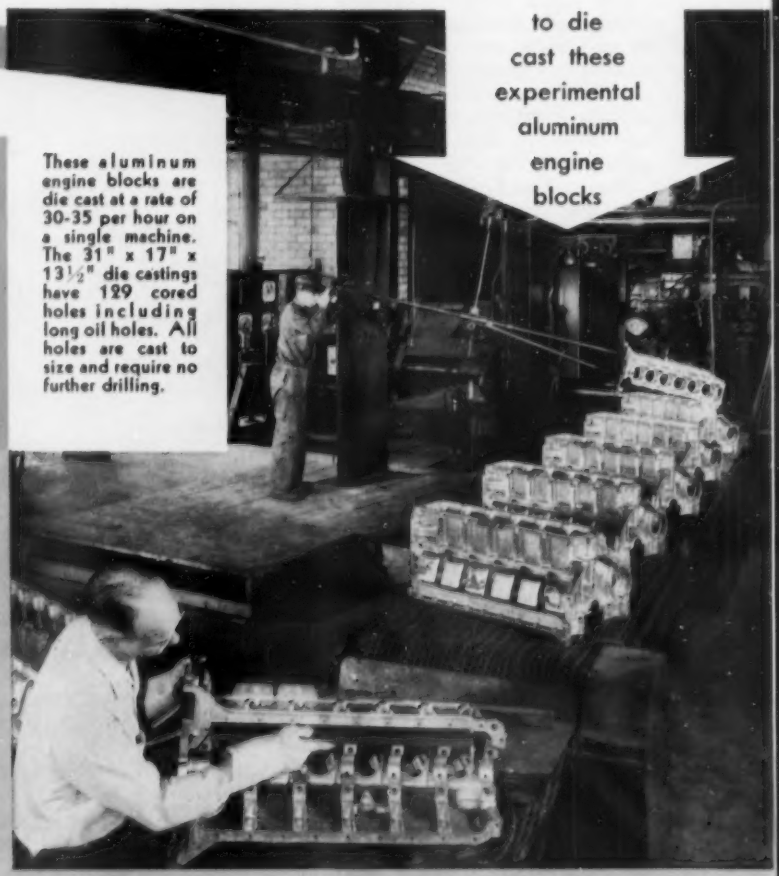
HENNING BROS. & SMITH, INC.
91-117 Scott Ave. at Randolph St., Brooklyn, N. Y.
Smelters & Refiners of Aluminum • Bronze • Brass • Zinc • Lead
"Dependable service since 1922"
All ingot produced under Laboratory control
For more information circle No. 32 on the Reader Service Card

Latrobe's VDC

DIE CASTING DIE STEEL used by

Doehler–Jarvis Division
National Lead Company Toledo, Ohio

to die cast these experimental aluminum engine blocks



These aluminum engine blocks are die cast at a rate of 30-35 per hour on a single machine. The 31" x 17" x 13½" die castings have 129 cored holes including long oil holes. All holes are cast to size and require no further drilling.

Here's why leading die-casters choose VDC for intricate dies . . .

VDC has sound structure and freedom from porosity—important factors when sinking die cavities.

Long production runs obtained with VDC. Excellent resistance to wash and heat checking.

VDC has superior resistance to size change during heat treatment.

Latrobe's VDC hot work die steel is an air-hardening, 5% chromium die steel especially suited for aluminum, zinc, and magnesium die casting dies. Its high vanadium content increases resistance to wash and heat checking and imparts superior properties at elevated temperatures.

VDC also possesses excellent impact strength, is easy to machine and can be water cooled in service.

VDC hot work steel is stocked in a wide range of sizes in Latrobe's conveniently located warehouses. Call your Latrobe representative . . . specify VDC for your next die casting die.

For more information circle No. 41 on the Reader Service Card

LATROBE STEEL COMPANY
Main Office and Plant: Latrobe, Pa.

Branch Offices and Warehouses in Principal Cities

NON-DESTRUCTIVE TESTER
. . . checks on flaws & thickness

A new sonic type thickness measuring device and flaw detector has recently been announced. The instrument requires access to only one surface of the material being checked and will work on metals, glass and unfilled plastics.

The testing unit consists of an oscillator, cathode ray oscilloscope and transducer. When the frequency of the oscillator is the same as the resonance frequency of the material, a vertical marker appears on the face of the tube indicating the exact thickness of the material by pointing to a calibrated screen.

Any flaw, discontinuity or lack of bonding is indicated by a shift or disappearance of the thickness reading.

Alcar Instruments, Inc.
For more information, circle No. 211 on the Reader Service Card

HARD MINERAL WAX
. . . in place of vegetable wax

In the formulation of wax mixtures for the investment casting industry, the hard vegetable waxes such as candelilla, palm and carnauba are generally used.

Now a group of synthetic mineral waxes are available that are reported to have absolute uniformity of composition and properties since they are formed from carbon monoxide and hydrogen under carefully controlled conditions.

Dura Commodities Corp.
For more information, circle No. 209 on the Reader Service Card

VACUUM FURNACE
. . . for high temperature

A new high temperature vacuum furnace designed for research or small production work is capable of operating at temperatures up to 2500F and pressures down to 200 to 300 microns.

The muffle is 7½" x 5" x 13" deep and is heated by resistance heating elements. Features claimed for the furnace include the ability to obtain low pressures in a short time when material to be heated is placed in the hot furnace; easy access to the furnace through a removable end bell and a hinged door; and compact assembly of the furnace, pumping equipment and electrical controls.

Harper Electric Furnace Corp.
For more information, circle No. 213 on the Reader Service Card

NOW

...a larger furnace to produce investment castings up to 20 lbs.

Here's the new, larger, direct casting furnace, for investment castings up to 20 pounds. It has all the features and advantages of Detroit Electric's successful, 10-pound IC furnace, which is producing high quality castings for many exacting uses.

The new ID Furnace features fast, indirect arc melting. Metal analysis is maintained without carbon contamination from the electrodes. The mold is clamped to the furnace when metal is ready and the mold is poured simply by inverting the furnace.

Let us tell you the complete story of operation and production advantages of the new ID Furnace. Write or call today.

DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • 1070 26th St., Bay City, Mich.

For more information circle No. 39 on the Reader Service Card

BONDED BI-METAL
continued from page 46

powered outboard motors. The first development in this field was the alloy steel-lined aluminum die cast water pump housing for use in western waters where high volcanic ash content results in rapid wear of convention all-aluminum pumps.

Outboard motors have used die cast aluminum blocks with cast-in iron liners for a number of years. The increasing interest in larger outboard powered boats has resulted in the need for increased power which requires either a larger and heavier engine or increased performance in engines of the same physical size. The decision has been made to utilize existing tooling and to obtain increased output by increasing brake mean effective pressures. The necessary increased cylinder cooling has been obtained by Al-Fin bonding the iron cylinder liners to the aluminum block.

Fuel Pump Impellers

In the field of investment castings, Brown Engineering and Service Company, Wickliffe, Ohio, is utilizing the Al-Fin process for manufacturing cast aluminum aircraft fuel pump impellers with bonded-in steel shafts by the lost wax technique. These impellers operate at speeds in excess of 30,000 RPM at which speeds the centrifugal loading is sufficient to cause deformation of the aluminum and loosening from the shaft when the latter is merely cast, pressed or keyed in place.

Experimental work is being conducted in the electronic wave guide plumbing field where Kovar and other ferrous alloy inserts are being bonded to precision cast aluminum wave guides, flanges, and other parts to permit soldering in of windows and ferrous and copper alloy components.

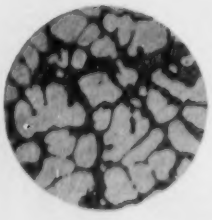
EXPAND TOLEDO PLANT

Surface Combustion Corporation will expand its Toledo plant by the construction of a new building adjacent to its present factory, according to an announcement by Frank H. Adams, president.

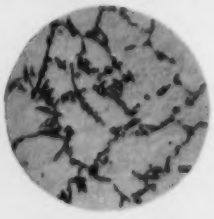
USE FLUX... for Clean Metal, Sound Castings

for aluminum base alloys with 5% silicon or more

ROSSBOROUGH MOD-SIL PELLETS



150 X
WITH MOD-SIL FLUX



150 X
WITHOUT FLUX

GIVES PROPER SODIUM PICK-UP, thus changing the solidification rate of high silicon aluminum alloys. Better elongation and tensile strength result. Porosity and associated notch sensitivity are greatly reduced.

other ROSSBOROUGH FLUXES:

B-11 Flux for Brass, Bronze and Copper
B-12 Flux for High Tin, High Lead Alloys
A-102 Aluminum Boiling Flux (for permanent mold work)
A-103 Aluminum Wet Flux (for running down borings or turnings)
A-104 Titanium Addition Flux
A-105 Magnesium Removal Flux
A-106 Aluminum Flux
A-107 Zirconium Addition Flux
A-108 Aluminum Hex Degasser
Z-21 Zinc Flux
MS Magnesium Shaker Compound (Permanent Mold)
MT Magnesium Topping Compound (Permanent Mold)
MR Magnesium Grain Refining Compound
Aluminum Permanent Mold Spray
Ladle Coat & Pot Wash
M-144 Magnesium Shaker Compound (Sand)
M-21 Magnesium Shaker Compound (Sand)
A-110 Aluminum Smelting Flux
A-112 Mod Sil Pellets
A-113 Titanium-boron addition
A-112 Super Degasser Pellets

Ask for technical information and your jobber's name.

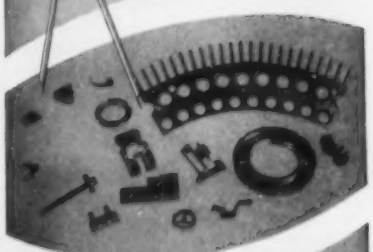
ROSSBOROUGH SUPPLY CO.

Phone: Winton 1-6115

• 3376 West 137th Street • Cleveland 11, Ohio

Circle No. 61 on the Reader Service Card

B-MOLD



PRECISION NON-FERROUS PERMANENT MOLD

CASTINGS

Aluminum Bronzes, Manganese Bronzes, Yellow Brasses, Beryllium Copper and Aluminum Alloys

Consult our Engineering Department, without obligation.

B-MOLD DIVISION
Buckeye Brass & Mfg. Co.
671 N. Main St. • Mansfield, O.

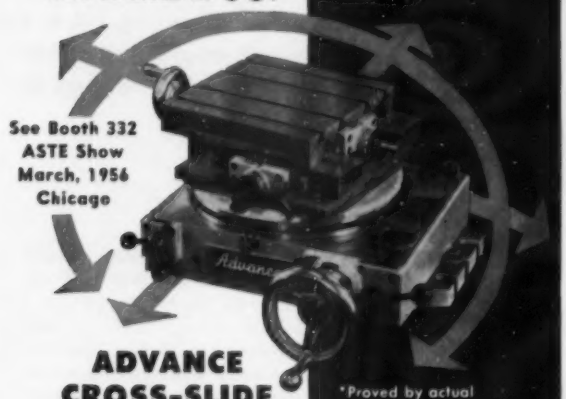
Circle No. 14 on the Reader Service Card

For more information circle No. 50 on the Reader Service Card

Cut Die-Making Cost

by reducing set-up time as much as 90%

With Jig Boring Accuracy



ADVANCE CROSS-SLIDE ROTARY TABLE

*Proved by actual on-the-job performance

permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

Ideal for tools, dies, jigs, fixtures, gauges, patterns, molds, cams, templates, models and experimental work. Write for specifications and literature today.

MORRISON ENGINEERING COMPANY

943 West Lake St., Dept. C, Chicago 7, Ill.

OHIO this is precision casting!

This casting, of OPC 356 Aluminum, heat treated, is produced for The Morse Instrument Co., manufacturers of photographic and marine equipment.

The long, narrow opening running through the center of this casting is just .0625" wide. For its entire 7⅜" length, OPC maintains this width exactly, within a tolerance of ±.005".

Accuracy in the most intricate detail is just one advantage of using OPC castings. Another is the smooth finish that eliminates hours of machining time. Still another is durability. You can get all these, plus strict adherence to your print specifications, prompt quotation and delivery AND overall lower costs, when you check first with OPC.

We have an illustrated brochure that contains several interesting examples of small parts production savings in a variety of industries. May we send you a copy?

OPC OHIO PRECISION CASTINGS, INC.

P. O. Box 55—Station A • • • DAYTON 3, OHIO

Plaster Mold Castings made from

BRASS • BRONZE • ALUMINUM • BERYLLIUM COPPER

For more information circle No. 53 on the Reader Service Card

---

Greater Efficiency

for SHIPPING and PROCESSING TEXTILES and WIRE with SPOOLS and BOBBINS

Die Cast IN ALUMINUM MAGNESIUM

As shown here, spools and bobbins of almost any size or design can be die cast by LITEMETAL in single units from aluminum and magnesium. Their efficiency and economy for the processing and shipping of wire and textiles has been proved. Our experience in manufacturing them is most extensive.

The die casting of parts from the new lightweight alloys—aluminum and magnesium—are practically limitless for uses and applications in almost every form where metal components are manufactured. The die casting process effects great savings in time and materials and virtually eliminates all costly labor otherwise required for machining and finishing. Important too are the savings in weight which often greatly reduce shipping costs and inplant handling.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists—men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs—little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST Inc.

A DIVISION OF HAYES INDUSTRIES

1925 WILDWOOD AVE • JACKSON, MICHIGAN

PLANT AND EXECUTIVE OFFICES

For more information circle No. 43 on the Reader Service Card

BURNING OFF THE ALCOHOL

Photo: Lebanon Steel Foundry

CRAZE-CRACKING: THE "SECRET" OF SHAW PROCESS

A SPECIAL mold composition with unique setting characteristics and unusual type of porosity that not only vents the mass, but also furnishes dimensional stability to it, is the "secret" of the Shaw Process. Here is the way it works:

The unusual properties of the mold material depend upon a carefully controlled jelling process, initiated by the addition of a re-agent to a colloidal suspension of silica in alcohol. Produced by controlled hydrolysis, the reactive liquid is a derivative of a special prepared ethyl silicate. This mixture or slurry, which is prepared by first mixing the re-agent liquid with the colloidal suspension and then adding the powdered plaster to this liquid remains mobile for a period which is readily controllable by the amount of re-agent added. In practice this period is so regulated as to allow time for the slurry to be poured over the pattern.

As the jelling progresses, the slurry solidifies and passes through a tough rubber-like phase. The time of solidification may be varied from a few seconds to several hours at the discretion of the pourer. This is sometimes necessary when very elaborate cavities are being made requiring a number of different sections of considerable size which would cause several batches of slurry to be mixed.

As solidification occurs the chemical reaction which takes place is accompanied by the liberation of alcohol, and it is a peculiarity of the particular jell employed, that, as the alcohol is lost from the surface by evaporation, craze-cracking occurs. This crazing is progressive in that once the outer surface has been crazed, the first system of cracks provides an outlet of the alcohol from beneath the surface. This liberation sets up further deeper cracking releasing more alcohol and so on until the entire mass is reduced to very small granules.

This same phenomenon occurs in the molding slurry, but under properly controlled conditions, the cracks are so small that the final mass does not disintegrate but retains a considerable strength and dimensional stability.

Because of the formation of these interlacing minute cracks, shrinkage of the mold material during solidification is negligible. Increased temperature has the effect of accelerating the action by giving rise to smaller and more uniform granulation. It is therefore possible to preheat the plaster mold pieces as high as 1890 F to enable various tool steel alloys to be poured readily and to reproduce the finest surface details.

It is necessary to ignite the molds before pouring the castings, in order to drive off all traces of alcohol. If ignition is not carried out almost immediately (this can be done by blow torch, gas burner or bunsen burner) solidification has taken place, the mold will disintegrate or at least become seriously weakened. Ignition, therefore serves the dual purpose of driving off the alcohol and giving rise to the required granulitic structure. Because the cracks are so fine they have no adverse effect on the casting finish, and the resultant mold structure has excellent venting and thermal properties. Venting is so efficient that no other provision is necessary, and the material is also a very good heat insulator. While possessing adequate stability to withstand handling and pouring, it collapses readily and offers no resistance to the contraction of the metal. It is thus a very suitable material for molds containing fine detail and intricate section.

Among other properties of the plaster mold material that may be mentioned are high resistance to thermal shock at elevated temperatures The material is completely inert at temperatures up to 1800 C and it is this property that renders it suitable for casting the materials already

Continued on page 89

In a recent survey of users of die castings, 64% said that the principal reason they don't use more die castings in their products is the cost of tooling. Here, now, are details of a British casting process that is being used for . . .

FOR a number of years, British manufacturers have been using dies and molds made by a precision casting method that yields tools at a fraction the cost of completely machined cavities. This process, recently introduced into the United States*, is expected to find important usage not only as a die making technique, but also as a means of producing commercial castings.

Called the Shaw Process, it has been used successfully in Great Britain for making die casting die cavities and other die components, as well as molds for forging, extrusion, permanent mold casting, rubber molding, glass forming and other industries that employ molds normally made by die sinking.

Special features reported for this process include:

- Close accuracy of dimensions obtained,
- Smooth as-cast surfaces,
- Low pattern costs,

DIE CASTING DIE CAVITIES

1. CORES FOR PISTON DIE (A) are cast by Shaw Process, as are the sand casting core box (B), and shell mold patterns (C).

Low Cost Molds And Dies By Casting

- Unlimited size and section thickness,
- Speed of getting into production,
- Good metallurgical properties of the cast metal.

Tool steels, cast by this patent foundry process, respond normally to heat treatment; Austenitic stainless and heat resisting steels are readily handled, as are the carbon steels, hard cobalt base alloys, nickel base alloys of the Nimonic types, and other high melting alloys.

Here is a report of some features of this process, with special emphasis on the manufacture of dies, molds and other tooling. In a second article, some of the production castings that have been made in England and the United States will be discussed.

The Shaw Process, first introduced into the U.S. on a jobbing basis by Lebanon Steel Foundry Co., is now represented for licensing and development by the Shaw Development Corp.

* Precision Castings in Ceramic Molds: A New Process, PMM Oct '55, pg. 100.

Die Cavity: Please Rush!

Speed of getting into production is one of the attractive features of this process. Simple and inexpensive pattern materials, such as metal or wood, plastic, clay, plaster or ordinary models or samples, can be used.

An American jewelry firm is using Shaw cast die cavities to produce die cast zinc jewelry findings. These cavities, Figure 4, were made from samples, and required only a half day's labor. An additional couple of hours for polishing and machining the outside of the cavity to fit the die block, completed the job.

The process can be used to duplicate existing cavities or cores from positive or negative master patterns. Because this process picks up surface detail from the pattern with great accuracy, it is desirable to start with highly polished patterns. This minimizes the amount of polishing to be done on the cast cavity.

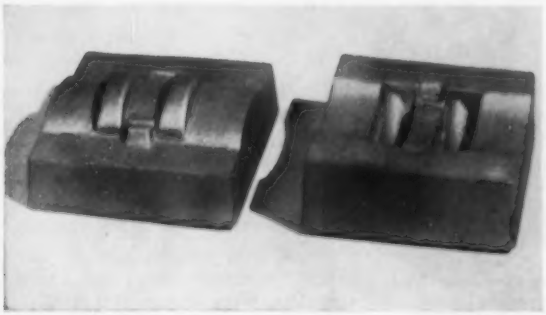
With properly prepared patterns, the surface finish on the cast die cavity can be held within 50 to 60 microinches, according to Shaw engineers.

Tolerances on castings can be held as close as ±.003 per inch on selected dimensions. Shrinkage of the ceramic mold material is so negligible that the only shrinkage allowance needed in making the patterns is that for the metal itself.

How big a piece can be cast? There is virtually no upper limit to the size of casting that can be produced in these ceramic molds, other than a purely economic one dictated by the cost of the mold material. The largest set of dies cast by Shaw Process to date, Figure 5, weighs approximately 1,250 lbs. consisting of a die weighing more than 750 lbs. and a plunger about 500 lbs. to produce fibre glass-resin cabinets.

Continued next page

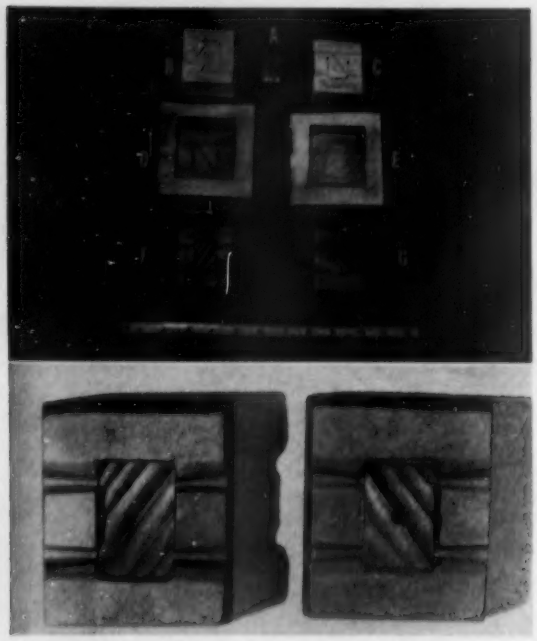
AND DIE COMPONENTS CAST TO SHAPE . . . . .



2. DIE CASTING DIE CAVITY, cast to shape, needs only surface polishing and machining the piece to fit into the die pocket. This pair of cavities is being used by a jewelry manufacturer for producing zinc die castings.

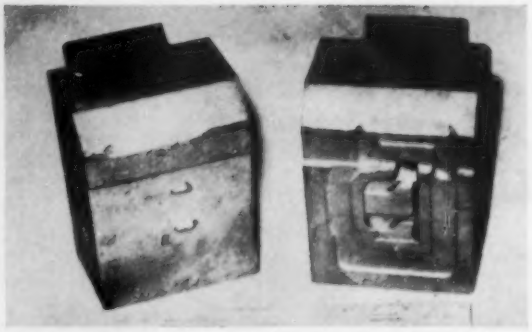
3. DIE CASTING CAVITY for producing a motorcycle fly wheel in aluminum alloy is shown at the right, above, together with a casting subsequently produced from this cavity. Note the surface finish of the cavity.

What type of die do you need?



4. HALF A DAY from original model (A) to die cavity ready for polishing, (F and G) is illustrated by the two photos, above. The ceramic molds for producing each die half are shown at D and E. Speed of getting into production is one feature of the process.

5. HEAVIEST molds cast, so far, are these halves of a die set for molding fiber glass and resin into cabinets. Total weight 1,250 lbs.



6. DROP FORGING DIES cast in tungsten-molybdenum-chromium steel by the Shaw Process weigh about 70 lbs. apiece.

7. PLASTIC MOLD halves illustrate the surface finish achieved, along with the intricate detail about the face of this plastic doll's head.

8. EXTRUSION DIES can be cast in a more abrasion-resistant alloy and thus extend the useful life of the die. These inserts are in cobalt alloy.

LOW COST CAVITIES—continued

Not only have dies for die casting and plastics been made by this method, but also tools for extrusion, drop forging and other processes. Some of these tools are illustrated to show the range of size, shape and surface finish obtained.

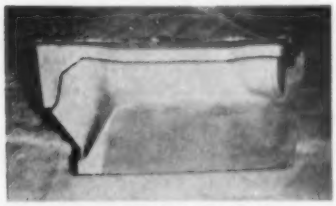
How does the metallurgical quality of these cast dies compare with that of completely machined ones? British experience has indicated a favorable comparison, with the service life of the cast die likely to be longer than that of the machined die. It is also possible, in many cases, to use a superior die material that is castable but not readily machinable.

For example, one company had been using conventionally machined steel dies for extruding copper. These dies had an average life of about 250 extrusions before needing replacement. Now, cobalt base inserts for this same job, as cast by Shaw Process, have produced more than 2,000 billets and are reported to be still in satisfactory condition.

A group of Shaw castings in Figure 1 indicate the manner in which this process can be used to complement other casting techniques. With the exception of the ring-shaped casting in the foreground, all of these pieces represent difficult machining jobs, but are relatively simple in ce-

ramic molds. Castings include cores for die casting dies, core box for making blown sand cores, and two patterns for shell mold castings.

Components "A" in Figure 1 are parts of a die assembly for die casting aluminum pistons; they incorporate bosses, relieved surfaces between the ring grooves, and other details. In their die, they are mounted on each side of a central slide which is first withdrawn to allow the loose side pieces to be removed from the undercut areas. These loose cores wear and must be replaced periodically, which would call for extensive machine work if they were not cast. Now, they require



9. LARGE PLASTIC MOLD component is cast in a 12 percent chromium steel.

no finish on the working faces, and only a light cut on the faces that mate with the central slide.

Core boxes, Figure 1 "B", are complex shapes, but need only light grinding on joint faces before being used. In the lower of the core boxes, two cavities are incorporated to speed core production. Machining allowance of .020 is left on mating surfaces.

Patterns for shell molds have also been successfully made, as shown at Figure 1 "C". By this technique, any number of identical shell mold patterns can be obtained. Shell mold pattern at the right, with simple annular shape, illustrates the remarkable stripping properties of the Shaw mold material during its flexible phase. This pattern has fine, longitudinal knurling on the circumference.

The steps in the process of producing a die cavity for making die cast jewelry findings are illustrated in Figure 4. This work started with an actual sample of the finding. The die cavity has been cast in a high chrome-nickel steel and requires only hand polishing and light machining to fit into the die pocket. Two different jewelry findings have been used to make die cavities, and in each case, the non-straight die parting line would have provided compli-

Now you can buy CUSTOMIZED conveyors in pre-fabricated STANDARD sections

In a **single glance**, you can see all of the advantages of MAY-FRAN STANDARDIZED components.

The five standard sections shown can be assembled to form virtually any type of *"customized"* conveyor for the handling of stampings, formed metal parts, forgings, automotive scrap, chips and turnings.

Straight sections . . . concave or convex sections . . . take-up charge and discharge-end sections can be furnished to meet specific requirements of belt width as well as load bearing and volume capacities.

A **single glance** at the MAY-FRAN conveyor standardization program, and you will see savings never before possible. In addition you will see unsurpassed conveyor flexibility.

MAY-FRAN . . . a name long recognized in the materials handling field . . . is **FIRST** again with *standardized* components for your *customized* installation.

MAY-FRAN

ENGINEERING, INC.

1686 Clarkstone Road
Cleveland 12, Ohio

Write today for complete information.

For more information circle No. 47 on the Reader Service Card

METALWORKING

bids for top industrial place in

NORTH CAROLINA

Outstanding in the industrial diversification picture of North Carolina is **metalworking,** represented by companies making a variety of products.

The rapid over-all industrial growth of North Carolina has created an important market right at hand for producers of instuments, machinery, and many other results of metal processing. More than half the population of the country is within overnight reach, giving North Carolina metalworking companies advantageous access to the national market.

Abundant labor is available, and records show exceptionally low absenteeism, turnover and accident rates. Mechanization of farms provides increasing numbers of healthy, cooperative workers, with the ability to acquire new skills in a surprisingly short time.

Business development foundations in sixty-one communities are prepared to erect buildings to meet the specifications of incoming and expanding industries.

Desirable plant sites, urban and rural, are available in the mountain, piedmont and coastal regions of North Carolina.

Send for already-prepared briefs on any special location in mind or an allstate "Industrial Location Factors" brochure.

DEPARTMENT OF CONSERVATION & DEVELOPMENT

Raleigh 17, North Carolina

Governor Luther H. Hodges, Chairman of the Board

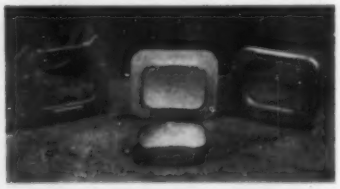
For more information circle No. 52 on the Reader Service Card

cations for machined cavities, but were simple in cast cavities.

Illustrative of the heavy duty tools that can be produced by Shaw Process is the pair of drop forging dies, Figure 6, cast in a 0.3 percent carbon, 1 percent tungsten, 5 percent chromium, 2 percent molybdenum steel. Weight of each casting is about 70 lbs.

One of the commonest tooling applications for steel castings of this type is in the molding of plastics, where a 14% chromium, 2% carbon steel is generally employed. Excellence of surface detail can be seen in the mold set for a doll's head, Figure 7. No work has been needed on the mold surface except for machining mating surfaces and preparing the outside to fit the die pocket. In Figure 9 is a large plastic mold component weighing 180 lbs. in 12.14 percent chromium, 2 percent carbon steel.

The glass industry has been another important user of these cast molds. An example of these is Figure 10, used for making television tubes. A stainless steel is suitable for this type of mold, requirements of which include very smooth surface detail. The shape of castings for making TV tube, Figure 10, suggests the possibility of casting die casting trim dies.



10. GLASS MOLDS for forming television tubes have been successfully cast in ceramic molds.

Altogether, the use of a precision casting technique for producing dies and molds will stimulate further use of the processes that require these dies. Tooling cost, always one of the main limiting factors, can be sharply reduced. If the cost of a die casting die of intricate contours can be brought down within a range not too much in excess of the cost of sand casting patterns, then many new jobs will find their way into the die casting shop that have previously been kept out only because of the high starting investment in tools.

Circle No. 8 on the Reader Service Card

SERVICE IN ALL MELTING PROBLEMS WHERE FLUXES ARE USED

PROVEN USED BY DIE CASTING PLANTS FOR MORE THAN 15 YRS.

New SMOKELESS ZINC FLUX LATEST DEVELOPMENT

ZINCOREX "DT"

has been improved to give your metal more fluidity and to prevent sluggishness. Zincorex "DT" does away with obnoxious ingredients, will not absorb water, reduces fumes. Application of Zincorex "DT" gives you:

1. increased fluidity of metal
2. lower rejects and faulty castings
3. savings of metal (retained free of dross)

ALUCO "S"

is designed specifically for die casting aluminum base metals. With it, you can be sure of: reduced oxidation; removal of non-metallic inclusions; sound castings with minimum rejects.

Write for free samples and technical data.

Atlantic Chemicals & Metals Co.
1921-27 N. Kenmore Ave. • Chicago 14, Illinois

CRAZE-CRACKING
continued from page 84

mentioned, such as tool steel and low carbon steels.

In order to render materials of this type sufficiently mobile for satisfactory die components it is usually necessary to pour them at very high temperatures. At these high temperatures most conventional refractories become chemically reactive with the molten metal, and slag and gas inclusions, pit marks and similar defects generally result. The mold material employed in this process however, will withstand such temperatures and enable sound castings with high grade surface finish and no pit marks to be produced.

Another property of the mold material is that whereas the plaster molds are generally quite satisfactory for use immediately after ignition, the longer they are stored the better the results obtained. Thus the molds may be accumulated over a period and poured when convenient. This characteristic is especially useful when it is desired to pour a number of different cavities and cores at the same time in one particular melt of a specific type of tool steel.

Circle No. 48 on the Reader Service Card

METAL POWDERS

Prime Producers
OF
Stainless Steel Powder
AND
Stainless Steel Dry Flake
TYPE 302

Representative for
METAL POWDERS LTD.
Iberville, Quebec
Manufacturers of
IRON POWDERS

mpa MEMBER METAL POWDER ASSOCIATION
MICRONIZED METALS, INC.,
38-12 TENTH STREET
LONG ISLAND CITY 1, N. Y.

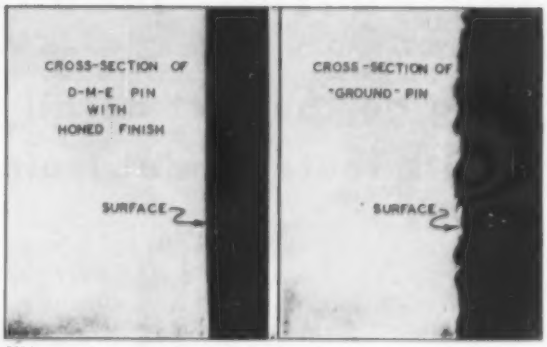
Another Reason Why . . . DME **EJECTOR PINS** *are the Finest Made*

HONED FINISH

REDUCES WEAR and MOLD FLASH

D-M-E Ejector Pins are hot-forged, precision ground, nitrided and THEN HONED . . . to give you the finest finish possible. The photo-micrographs shown here illustrate clearly the result of this added D-M-E feature.

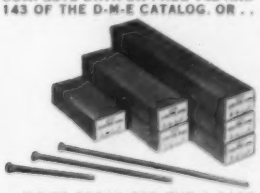
Under magnification of 500 X the so-called "ground" finish pins reveal a saw-like surface which gradually opens up the hole surrounding the ejector pins and eventually causes mold flash. D-M-E's "honed" Ejector Pins, under the same magnification, reveal a smooth finish which reduces wear and costly down time.



The above photo-micrographs were made in an impartial test by the Detroit Testing Laboratory, Inc. of Detroit, Michigan.

42 Standard Diameters from 1/16" to 3/4"
IMMEDIATE DELIVERY . . . 5 BRANCHES

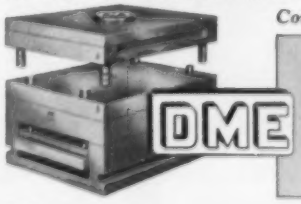
COMPLETE DATA ON PAGE 142 AND 143 OF THE D-M-E CATALOG. OR . .



. . WRITE TODAY FOR THE 8 PAGE EJECTOR PIN DATA FILE!

DETROIT MOLD ENGINEERING CO.
6686 E. McNICHOLS ROAD — DETROIT 12, MICHIGAN — TWinbrook 1-1300

Contact Your Nearest Branch FOR FASTER DELIVERIES!



HILLSIDE, N. J. (NEAR NEWARK) 1217 CENTRAL AVE., ELIZABETH 3-5840
CHICAGO 51, ILLINOIS 5901 W. DIVISION STREET, COLUMBUS 1-7855
CLEVELAND 14, O.—D-M-E CORP. 5473 LAKE CT., ENDICOTT 1-0907
LOS ANGELES 7, CAL. 3700 SOUTH MAIN STREET, ADAMS 3-8214

2355
For more information circle No. 23 on the Reader Service Card

Lionel chose Kux Die casting machines

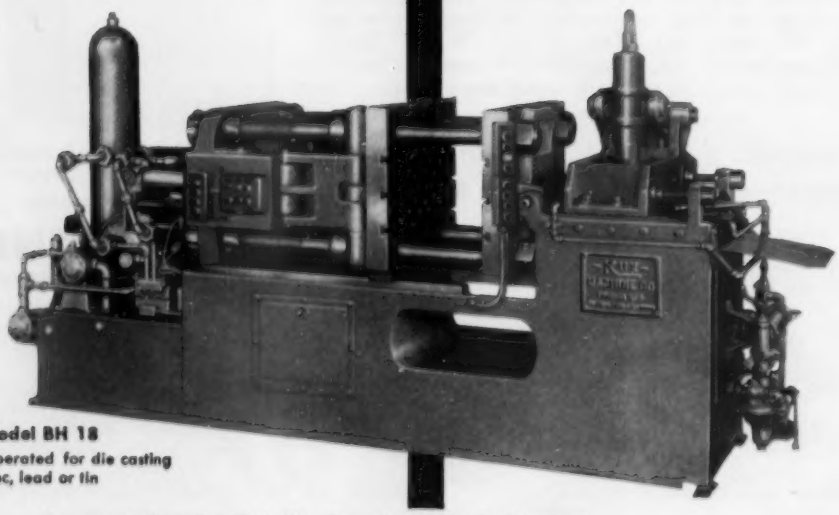
to get perfect detail in its scale model trains

The Lionel Corporation, largest and finest maker of toy electric trains, knows that its customers require exactness of detail from gear boxes to the colors in the insignias of famous trains it reproduces. Much of this detail is possible only because of the perfection obtained by the use of die cast parts made on KUX machines. Lionel finishes must match those of the real life counterpart to the minutest detail . . . they have to be tough and durable enough to withstand the knocks of railroads operated by boys from "six to sixty."

KUX Die Casting Machines produce tough, smooth, non-porous castings that make these finishes possible. They add strength to the trains, provide superior performance, and permit an economy of production so Lionel can sell its products at the lowest possible price.

KUX engineers can help you solve equally tough production problems with exactly the right machine to meet your requirements . . . whether it's tiny gear boxes or gigantic castings. A letter or card will bring you full information.

KUX MACHINE COMPANY
6725 N. Ridge Ave. • Chicago 26, Ill.



Model BH 18
Hydraulic operated for die casting zinc, lead or tin

For more information circle No. 40 on the Reader Service Card

NEWS OF INDUSTRY AND ASSOCIATIONS

PROGRAM ANNOUNCED FOR APRIL MPA MEETING

Program for the Twelfth Annual Meeting of the Metal Powder Association, to be held at the Hotel Cleveland, Cleveland, Ohio, April 10, 11, 12, 1956, is near completion, M.P.A. has announced. Diverse areas of powder metallurgy applications will be discussed by speakers at the meeting, which is open to the public. Held in conjunction with the meeting will be the 1956 Metal Powder Show at which a full house of exhibitors will display the latest developments in powders, fabricated parts, and press, furnace and other equipment. The program lineup:

The Applications of Powder Metallurgy in Nuclear Engineering,
H. H. Hausner,
Sylvania Electric Products, Inc.

New Age Hardenable Brass Alloys Through Powder Metallurgy,
E. A. Anderson,
The New Jersey Zinc Co.

Cerametallic Friction Materials,
Raybestos Div.,
Raybestos-Manhattan, Inc.

Powder Metallurgy in Today's Automotive Industry
R. Blue,
Amplex Div., Chrysler Corp.

A Panel Discussion on High Density, Medium Density and Infiltrated Metal Powder Parts,
J. M. Copeland,
International Business
Machines Corp., Moderator

The Applications of Iron Powders and Ferrite Electronic Cores,
C. E. Cherry Jr.,
Metal Powder Association

Replacement of Castings by Powder Metallurgy
T. L. Robinson,
Powdercraft Corp.

BERYLLIUM CORP. BUYS INVESTMENT CASTING FIRM

The Beryllium Corp. has announced acquisition of the capital stock of National Precision Casting Corp., Clifton Heights, Pa., effective Feb. 1.

Beryllium Corp. officials said the acquisition, second in the past two months, represents another step in the firm's continuing long-range program to expand and diversify wherever practicable.

Officers of the Clifton Heights firm, chartered April 9, 1947, are Lester E. Chaundy, Sr., president; Lester E. Chaundy, Jr., vice president and treasurer; and Lee H. Rothrock, secretary.

HAUSNER HONORED

Dr. Henry H. Hausner, an expert in powder metallurgy and in the construction of atomic power plants has received the Stevens Institute of Technology Powder Metallurgy Achievement Award for 1956.

The award, a three-inch silver disk, was presented February 20. Dr. Hausner delivered a paper at the ceremonies titled, "Recent Advances in Powder Metallurgy in Both General and Nuclear Engineering Fields".

KOEGLER NAMED DIRECTOR

Frank J. Koegler has been elected to the board of directors of National Lead Company. Mr. Koegler, a company vice-president, is also general manager of its Doehler-Jarvis Division, a major producer of die castings.

Frank J. Koegler

He started with Doehler-Jarvis Corporation in 1913, and became treasurer and a director of the firm in 1926, a vice-president in 1933, executive vice-president in 1948 and president in 1952. In 1953, when Doehler-Jarvis was acquired by National Lead Company, Mr. Koegler was made general manager of the Doehler-Jarvis Division and a vice-president of National Lead.

NOMINATIONS OPEN FOR HIGHEST AWARD OF DIE CASTING INDUSTRY

Nominations for the Doehler Award, highest prize of the die casting industry, have been opened by the American Die Casting Institute, national association of job shop die casters. The Award, which is made annually, consists of a suitable plaque and a cash honorarium or at least $500.00.

The Doehler Award is made for outstanding contribution to the advancement of the die casting industry, or to the art of die casting. There are three considerations: (1) Technical achievement—as measured by significant scientific contributions of a metallurgical or engineering nature relating to the die casting process; (2) advancements in plant operations—of a management or administrative nature and related to the operational phases of the industry; (3) other activities—not primarily of a scientific or operational nature that result in the enhancement of the reputation and acceptability of die casting.

Nominations for the Award and supporting papers or other material will be received from January 15 to April 15. Entries should be addressed to: Award Committee, American Die Casting Institute, 366 Madison Avenue, New York 17, New York.

Barrel finishing time cut up to 75% with HONITE Multi-Burnish Compound

A leading camera manufacturer found that ball burnishing these parts with two competitive barrel finishing compounds took from 1½ to 2 hours per run. By switching to the HONITE Method and HONITE Multi-Burnish Compound, finishing time was cut to 30 minutes. Results? Three to four times more parts finished per day with the same equipment!

HONITE Multi-Burnish Compound is a multi-purpose compound that develops natural color on all metals, and produces a brilliant, clear luster. Multi-Burnish Compound is an effective deburring cleaner — prevents deposit of dirt on abrasive chips or parts. Too, it resists breakdown over long runs, and is free-rinsing. And, it is extremely economical to use.

Write today for a free demonstration in your plant of HONITE Multi-Burnish Compound

Honite BRAND

Minnesota Mining and Manufacturing Company
Dept. FF-36, St. Paul 6, Minn.

☐ Yes, I'd like a FREE demonstration of HONITE Multi-Burnish Compound

☐ Send me free copy of "Facts and Figures Report on HONITE Barrel Finishing" which contains complete information about HONITE Barrel Finishing Compounds

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Made in U.S.A. by Minnesota Mining and Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City. Makers of "SCOTCH" Brand Pressure-Sensitive Tapes, "SCOTCH" Brand Magnetic Tape, "3M" Adhesives, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing.

3M

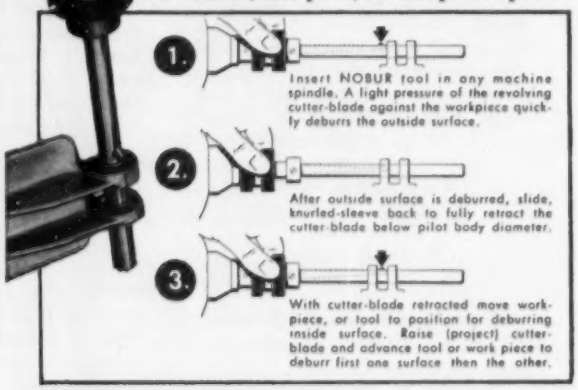
For more information circle No. 80 on the Reader Service Card

How to... DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION

★ faster
★ better
★ easier

with the amazing NOBUR TOOL

No more hand-finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by *machine operation*. Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.

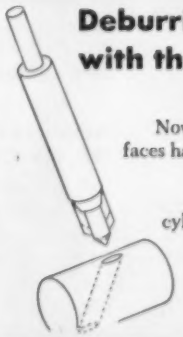


1. Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter-blade against the workpiece quickly deburrs the outside surface.

2. After outside surface is deburred, slide, knurled-sleeve back to fully retract the cutter-blade below pilot body diameter.

3. With cutter-blade retracted move workpiece, or tool to position for deburring inside surface. Raise (project) cutter-blade and advance tool or work piece to deburr first one surface then the other.

HERE'S ANOTHER PROBLEM SOLVED



Deburring Elliptical Holes with the *NEW!* ELLIPTI-BURR TOOL

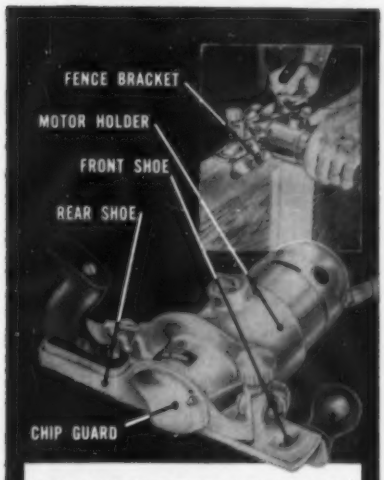
Now . . . deburr openly accessible hole faces having an irregular surface like those developed when holes are drilled angularly or when drilled through cylindrical bodies. This revolutionary tool is self-piloting with a two-lipped cutter that automatically follows the hole surface geometry. Write for full data.

Write for FREE Folder

Send for all the details on Nobur Tool Products — the key to *lower* costs, *higher* production and *improved* quality on your deburring operations. WRITE TODAY!

NO/BUR TOOLS **NOBUR** MANUFACTURING CO.
6860 Farmdale Ave., No. Hollywood, California

For more information circle No. 81 on the Reader Service Card



HAMPDEN BRASS

Die Castings have cleaner, smoother surfaces

Machining operations reduced to a minimum on (STANLEY) Power Plane

Hampden Brass's engineering department and the Stanley Electric Tool Division worked together to design the H33 Power Plane castings. These aluminum die-cast parts reduce machining time to a minimum. Each casting is of uniform thickness throughout, and all meet high quality standards in production quantities. Hampden Brass solved the problem of intricate coring and thin walls of the front and rear shoe, and the mating surfaces were used as cast . . . eliminating machining at the V-slide match. The result: quality die castings that fulfill every requirement at lower-per-unit cost.

Let HAMPDEN BRASS Help You Solve Your Casting Problems!

Avail yourself of our engineering counsel . . . or write for a casting quotation today!

Send for brochure, "Behind the Scenes" . . . complete digest of Hampden Brass's experience, equipment and facilities.

HB

HAMPDEN BRASS
AND ALUMINUM CO.
Established 1903
262 Liberty St.•Springfield, Mass.

Producers of Sand, Permanent Mold, Die & Fiberglas Castings

Circle No. 30 on the Reader Service Card

OPPORTUNITIES

Rates: $20 for the first column inch, $15 for each additional inch payable in advance

WANTED—Zinc end for 2400 Cleveland die casting machine. Write Box 3156, PRECISION METAL MOLDING magazine.

FOR SALE—Kux cold shot Al. hyd. die casting machine used very little, model K12 complete, $4800. Write Box 3256, PRECISION METAL MOLDING magazine.

BIG OPPORTUNITY FOR METALLURGIST WITH NON-FERROUS CASTING EXPERIENCE

One of Michigan's largest foundries—located in a city of 100,000 only a few miles from the midwest's greatest fishing, hunting, boating and vacation areas—is starting a research and development program in non-ferrous castings. They need a top-notch, experienced metallurgist. Must have college degree and potential to assume considerable management responsibility as program develops. Excellent salary, many security and extra benefits and a pleasant life for you and your family in a prosperous, stable, largely home owned, medium size city. Write resume of qualifications to Box 3356, PRECISION METAL MOLDING magazine.

INVESTMENT CASTING ENGINEER familiar with all phases of investment casting to set up and operate new "captive" foundry for midwest manufacturer of aircraft pneumatic and hydraulic equipment. Must have administrative ability and full knowledge of mold design, manufacturing techniques, selection of appropriate alloys, procurement of satisfactory raw materials and adequate melting and deoxidation procedures. Salary open. This is an outstanding opportunity for individual recognition, personal improvement and increased responsibility and pay. Write giving complete background and experience and present salary. Applications will be treated with strict confidence. Write Box No. 3556, PRECISION METAL MOLDING magazine.

Continued on page 94

ATOLS
TOOL AND MOLD CORPORATION

DESIGNERS & FABRICATORS

of

QUALITY MOLDS

for the

DIE CASTING INDUSTRY

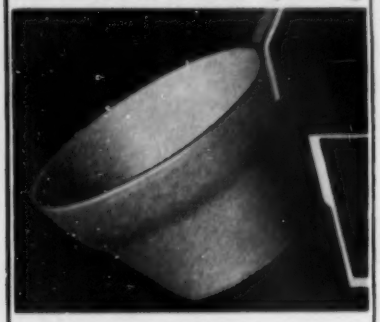
Complete designing and engineering. Modern plant & equipment includes BG-21 4' x 6' & BL-3620 Keller Duplicators.

5005 West Armitage Ave.
Chicago 39, Ill.
BErkshire 7-0800

Circle No. 9 on the Reader Service Card

NEW LADLES

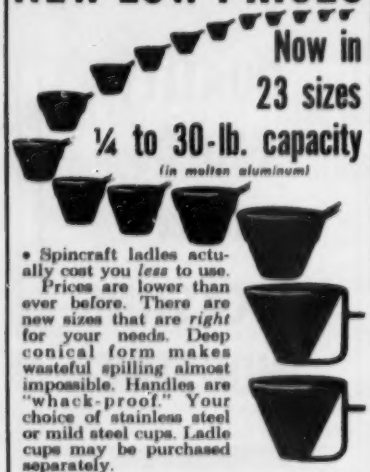
for non-ferrous metal pouring



• New Spincraft ladle design offers you reinforced cup bottoms and pouring edges of heavier gauge with the weight-saving side walls.

You get improved heat transfer . . . new lighter weight and better balance for "swinging" faster, safer and easier between crucible and mold or machine.

NEW LOW PRICES



Now in 23 sizes

¼ to 30-lb. capacity

(in molten aluminum)

• Spincraft ladles actually cost you *less* to use. Prices are lower than ever before. There are new sizes that are *right* for your needs. Deep conical form makes wasteful spilling almost impossible. Handles are "whack-proof." Your choice of stainless steel or mild steel cups. Ladle cups may be purchased separately.

TRY SPINCRAFT LADLES IN YOUR OPERATION

• You'll never know how good Spincraft ladles really are unless you try 'em in your plant, under your conditions. We're sure they'll *exceed* your expectations in reduced operator fatigue — in much longer ladle life. Write for prices. Complete data on non-standard sizes, gauges, materials quoted on request.

Spincraft

SKILL WILL DO IT

INCORPORATED

4131 West State St., Milwaukee 8, Wis.

Circle No. 63 on the Reader Service Card

OPPORTUNITIES (continued)

CHEMIST, CHEM. ENGINEER, CERAMIC ENGINEER—Research and development, pilot plant operations in investment casting. Send resume of training and experiences. Write Box 3456, PRECISION METAL MOLDING magazine.

DESIGNERS—Investment mold and casting design. High pay, overtime, benefits and security. Precision Metalsmiths, Inc., 1081 E. 200 St., Euclid 17, Ohio. Tel.: IV 1-8900.

24 YEARS A DIE CASTING SPECIALIST—Graduate engineer with experience ranging from die making & die design to complete charge of all production for major contract & captive plants, is seeking new connection in supervisory capacity. Will relocate. Write Box 3656, PRECISION METAL MOLDING.

EXPAND TOLEDO PLANT

Surface Combustion Corporation will expand its Toledo plant by the construction of a new building immediately adjacent to the east side of its present factory, according to an announcement by Frank H. Adams, company president.

It is estimated that the new plant building will increase the productive capacity of the Toledo plant by approximately one-third.

Circle No. 22 on the Reader Service Card

DIE CASTING DIES

FOR ZINC AND ALUMINUM

Complete engineering and tool room facilities for designing and building of die casting dies and plastic molds.

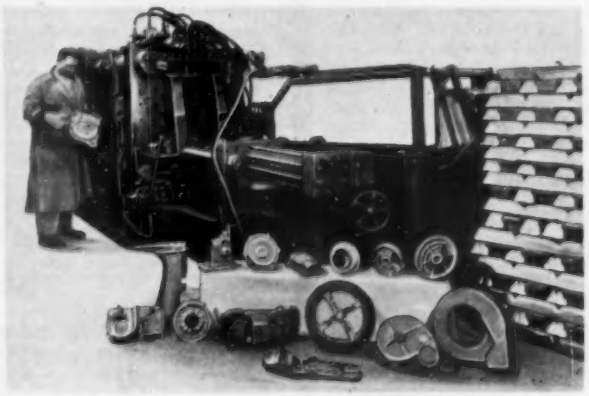
Highest standards of workmanship and skill go into the building of quality dies. Quality service a specialty.

Send your designs or samples to us for prompt quotation

DAMEN TOOL & Engineering Co.

2300 N. ELSTON AVENUE

CHICAGO 14, ILLINOIS



A solution to your casting problems may be in this group of large and intricate zinc and aluminum die castings.

Our casting capacity, as represented by one of our many large machines, can produce larger castings than those shown here.

Our vast experience may end your present casting problems.

FEDERAL DIE CASTING CO.

2220 N. ELSTON AVE. CHICAGO, 14, ILL.

PHONE ARmitage 6-4803

For more information circle No. 27 on the Reader Service Card

ALUMINUM ALLOYS
continued from page 42

close of the war, before bringing the zinc content back to a higher maximum, the ASTM again conducted a series of tests.[24]

Test bars of this alloy were cast by three different producers, with zinc contents of 0.25, 0.50, 1.0, 1.5, and 2.0 percent, and one producer went to 3.0 percent zinc. These bars were then tested by three different laboratories, and the results are summarized in Figure 16 and plotted in Figure 17.[24] Again the slopes of the curves are zero showing that up to at least 2 percent, zinc has no effect on these mechanical properties unless it is an improvement in the elongation with higher zinc.

A common "old wives tale" to the effect that zinc was harmful to the corrosion resistance of aluminum castings, has been prominent throughout the years, in spite of the fact that wrought alloys containing zinc are widely used in the aircraft industry and are actually protected by an aluminum-zinc alloy as a cladding. Considerable work has been carried out both in England[25] and in this country [26], and it appears that if nominal amounts of zinc in an aluminum base alloy have any effect at only on the corrosion resistance, it is a beneficial one.

Facts on the effect of zinc were again demanded by the ASTM, and the bars from the same lots were exposed at three test sites where corrosion conditions are very severe.[21] The first site was on a roof top in New York, and the second and third sites were beach sites at Kure Beach, North Carolina, 80 feet from the ocean and 800 feet from the ocean, respectively. Because it was felt that these exposures were severe, the exposure periods were set at 1 year for the first test and the second period at 3 years.

The 1-year results have just become available[17], and they give almost irrefutable evidence that zinc up to almost 3 percent does not impair the corrosion resistance of this alloy in the slightest extent. The results are plotted in Figure 18. At New York, the exposed bars had the same tensile strength and a very slightly lower elongation than the initial bars at all zinc contents.

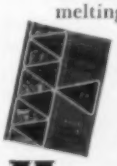
For more information circle No. 31 on the Reader Service Card

4 TIMES GREATER DROSS/METAL SEPARATION in ZINC and ALUMINUM MELTING WITH HAVILAND FLUXES

We have customers who are doing it now . . . separating *four times more metal from dross* with Haviland fluxes. They've found Haviland separated dross is so low in metal content that pulverizing or mechanical separation is both unnecessary and impractical! And they get better alloys, too.

FAST — even at lower furnace temperatures where other fluxes may fail.
SAFE — no dangerous, acrid, stinging fumes.
ECONOMICAL — you need less flux with Haviland . . . sometimes 50% less. You save both time and materials.

For free samples of Haviland fluxes for *your* zinc or aluminum melting operations, just drop us a line.



FREE BULLETIN — gives full information on these two new fluxes.
4B ALUMINUM FLUX — for use with all alloys and any type of furnace.
3G ZINC FLUX — complete alloy control . . . and extra metal savings.

Haviland PRODUCTS COMPANY
421 Ann Street, N.W. Grand Rapids 4, Michigan
Manufacturers of processing chemicals for the metal trades

aluminum . . .
▶ permanent mold castings
▶ die castings

EASTERN CASTING CORP. DIVISION
THE EASTERN MALLEABLE IRON CO.
64 South William Street, Newburgh, New York
For more information circle No. 26 on the Reader Service Card

At the two Kure Beach sites, the tensile strengths and elongations had been decreased by the salt spray corrosion, but the amounts of the decreases were the same for the low zinc content as for the high zinc content.

At all three sites, the yield strengths had increased under the exposure and again, the amounts were the same with the low, medium and high zinc contents. If the bars at Kure Beach have not been destroyed by the recent hurricane, it is expected that the 3-year results will show a similar trend.

In order to determine the effects of both silicon and zinc on the properties of this alloy at elevated temperatures, a series of short time tests was made on SC84A with the three modifications. Test bars were pulled after one-half hour at the respective temperatures, and the results of strength against temperature are plotted in Figure 19. [27] The 11 percent silicon content is illustrated by the solid lines, and the 9 percent silicon content by the dash lines, and it is apparent that both tensile strength and elongation seem to hold up better as

Circle No. 45 on the Reader Service Card

WE WIN the LOVING CUP*

*die cast by us for America's leading Trophy Manufacturer.

For High Finish Die Castings For The Toy, Novelty and Jewelry Industries.

LONG ISLAND DIE CASTING, INC.
21 Smith Street • Inwood 96, N.Y.

Ep Co
PRECISION CASTING

Saves $5 per piece for TV Tube Manufacturer

• Material Tool Steel
• Machining Eliminated except for finish grinding
Tolerances of ±.003 to ±.005

INVESTMENT CASTINGS IN ANY CASTABLE ALLOY EXCEPT MAGNESIUM.

Lost production and maintenance problems were caused when worn parts were refinished instead of scrapped due to high original cost. When reinstalled these parts had to be carefully shimmed resulting in poor performance and greater down time.

Now as an EPCO Investment Casting worn parts are discarded and replaced with new ones at less cost than refinishing.

Get an EPCO quotation before machining or assembling your intricate parts.

Sales Representative Wanted for Mid-West, Philadelphia and Baltimore.

Ep Co
ENGINEERED PRECISION CASTING CO.
FREEHOLD RD.
MATAWAN, N. J.

Circle No. 25 on the Reader Service Card

HERE IT IS! A LOW COST— HIGH SPEED
DIE CASTING MACHINE

UP TO FULL
2½ lb.
SHOT CAPACITY

Over 1100 Free Cycles Per Hour!

Reduce Costs—
Speed up Production—Increase Profits!

Now you can run high grade castings, up to 2½ lbs., at high speeds and low operating costs. Actual tests operating 8 hours a day, 5 days a week, show total cost of gas and electricity of ONLY 17c PER HOUR!

Outstanding features include—all steel welded construction—automatic electric cycling at high speed—17¾ x 17¾" die platens—6½" die stroke—highest grade controls and valves mounted for easy maintenance and accessibility—a complete package with self contained unit.

Available in Air or Hydraulically operated plunger gooseneck type for zinc, tin or lead, or, cold chamber type for aluminum, brass and magnesium.

Write for Free illustrated folder containing complete data on all models.

AMERICAN DIE CASTING MACHINERY CO.
1516-G Thomas St., Chicago 22, Ill. PHONE: Armitage 6-3334

COMPONENTS
(Standard Equipment)
- VICKERS Hydraulic System
- GREER Accumulator
- NORTH AMERICAN Blower
- SQUARE-D Electrical Controls
- MARVEL Synclinal Filters

and other high grade and nationally known brands.

For more information circle No. 12 on the Reader Service Card

temperature increases when the silicon content is at 11 percent. With each of these combinations, the zinc content of 1 percent maximum is indicated by the hollow circles and triangles and the 2.5 percent zinc content by the black circles and triangles. The differences between 1 and 2.5 percent zinc are so slight that no attempt was made to draw separate curves.

The castability of the alloy with 2.5 percent zinc is sometimes questioned. Contamination of aluminum alloys with zinc alloys in die casting plants often occurs, and thus a variable metal composition gives casting troubles which are often blamed on the zinc. If the zinc is accurately controlled by additions to the ingot and if it remains constant from one day to the next, castability has been found to be, if anything, superior to that of the alloy with the lower zinc content. Information on this castability has been presented to the American Foundrymen's Society,[27] and it can be summarized by recommending a slightly lower casting temperature for the Z39 in order to make a slower cycle unnecessary.

REFERENCES

18 D. L. Colwell, "Effect of Composition on Aluminum-Base Die-Casting Alloys", Proceedings, Am. Soc. Testing Matls., V. 31, Part I, p. 268, 1931.

19 Report of Committee B6, Proceedings, Am. Soc. Testing Matls., V. 35, Part I, p. 184 (1935).

20 Donald L. Colwell, "Investigation of Purity of Aluminum-Silicon Die Casting Alloys", Bulletin Am. Soc. Testing Matls., No. 163, January 1950, p. 51.

21 Report of Committee B6, Proceedings, Am. Soc. Testing Matls., V. 44, p. 261 (1944); V. 48, p. 191 (1948); V. 53, p. 207, (1953).

22 R. T. Staples and H. J. Hurst, "The Control of Quality in the Melting and Casting of Aluminum Alloys for Working", Journal Inst. Metals (London) V. 81, Part 7, March 1953, p. 377.

23 Minutes of meeting of ASTM Committee B6, June 29, 1955.

24 Report of Committee B*, Proceedings, Am. Soc. Testing Matls., V. 53, p. 212 (1953); and Report of Committee B6, 1955 Preprint.

25 F. H. Smith, "The Effect of Zinc in Aluminum-Silicon-Copper Casting Alloys", Metallurgia, V. LI, No. 303, January 1955.

26 Donald L. Colwell, "Zinc in Aluminum Casting Alloys", Trans. Amer. Foundrymen's Society, 1952, V. 60, p. 517 (1952).

27 Donald L. Colwell and Edward Trela, "New Aluminum Die Casting Alloys", Trans. Amer. Foundrymen's Society, 1954, V. 62, p. 359 (1954).

For more information circle No. 65 on the Reader Service Card

STROH

HAS MOVED

Yes, after over half a century in one location we have expanded into a brand new building complete with the latest and most progressive facilities available.

The address is different but the techniques and know how which have made STROH one of the greatest names in the industry remain unchanged. May we point out to YOU the advantages of having STROH supply your zinc die castings?

Inquiries Invited

STROH DIE MOULDED CASTING CO.
11123 W. Burleigh St., Milwaukee 10, Wisconsin

AUTO-DIESEL PLUNGER RINGS

have lasted OVER 122 DAYS

This reduces DOWN-TIME

When we say that Auto-Diesel Hardened Steel Plunger Rings have lasted over 122 days—we mean just that. They last for MONTHS instead of HOURS. IN MANY PLANTS THEY ARE GIVING OVER 100,000 SHOTS PER SET. (Names supplied upon request). Die casting machines will last much longer. Maintenance and down-time is reduced to the minimum. Made of cast iron, dieloy cast iron or hardened steel. Write us if you operate die casting machines or cast zinc parts.

YOU HAVE LESS DOWN-TIME with . . AUTO-DIESEL TWO or THREE PIECE Plunger Segment Rings

Down-time always costs money in many ways. This can be greatly reduced by using AUTO-DIESEL 2 or 3 Piece Plunger Segment Rings. They will give you LONG LIFE. Made of high grade wear resisting iron in sizes from 1½" to 4" for hot chamber die casting machines.

Write for Details

THE AUTO-DIESEL PISTON RING CO.
3135 Superior Avenue • Cleveland 14, Ohio
"RINGS and SHAPES Since 1921"

For more information circle No. 10 on the Reader Service Card

INDEX OF ADVERTISERS

A

Abbott Ball Co. 72
Accurate Die Casting Co. 78
Acheson Colloids Co. 39
Advance Products 83
Ajax Engineering Co. 13
Allied Research Products, Inc. 60
Alloys & Chemicals Mfg. Co. 22
Almco Div., Queen Stove Works, Inc. 62
Aluminum Smelting & Refining Co. ..... COVER II
American Die Casting Machinery Co. 96
American Zinc Sales Co. 76
Apex Smelting Co. ..... COVER IV
Arwood Precision Casting Corp. 28
Atlantic Chemicals & Metals Co. 89
Atois Tool & Mold Corp. 93
Auto-Diesel Piston Ring Co. 97

B

Badger Die Casting Corp. 46
Bellows Co., The 68
Buckeye Brass & Mfg. Co., B-Mold Division 82

C

Cannon-Muskegon Corp. 75
Cast-Master, Inc. 1
Certified Alloys Co. ..... COVER II
Cleveland Automatic Machine Co., The 17
Cleveland Tool & Die Co. 19
Conforming Matrix Corp. 69
Crucible Manufacturers Association 5
Crucible Steel Company of America 6-15

D

Damon Tool & Engineering Co. 94
Detroit Electric Furnace Div., Kuhlman Electric Co. 81
Detroit Mold Engineering Co. 89

E

Eastern Casting Corp., Div. Eastern Malleable Iron Co., The 95
Eclipse Fuel Engineering Co. 14
Engineered Precision Casting Co. 96
Ettco Tool Co. 59

F

Federal Die Casting Co. 94
Federated Metals Div., American Smelting & Refining Co. 70
Wm. Fiore, Inc. 65

G

Grav-i-Flo Corp. 58
Samuel Greenfield Co., Inc. 12
Groov-Pin Corp. 71

H

Hampden Brass & Aluminum Co. 93
Haviland Products Co. 95
Henning Bros. & Smith, Inc. 79
Hitchiner Mfg. Company 74
Hoeganaes Sponge Iron Corp. 11
Hoover Co., The ..... COVER III
Hydraulic Press Mfg. Co. 24

I

International Minerals & Metals Corp. 98
International Nickel Co., Inc., The 10

K

Kuhlman Electric Co., Detroit Electric Furnace Div. 81
Kux Machine Co. 90

L

Latrobe Steel Co. 80
Lebanon Steel Foundry 26
Lindberg Engineering Co. 27
Litemetal Dicast, Inc. 83
Long Island Die Casting, Inc. 96

M

Maas & Waldstein Co. 50
Madison-Kipp Corp. 4
Marvel Engineering Co. 8
May-Fran Engineering, Inc. 87
Micronized Metals, Inc. 89
Milwaukee Die Casting Co. 67
Minnesota Mining & Mfg. Co. 92
Morrison Engineering Co. 83

N

New England Die Casting Co. 30
Nobur Mfg. Co. 92
North Carolina, State Of 88
Norton Co. 61

O

Oakite Products, Inc. 84
Ohio Precision Castings, Inc. 83

P

Pangborn Corp. 67
Parker-Kalon Corp. 66
Peco Machinery Sales Ltd. 21
Peerless Aluminum Foundry Co., Peerless Die Cast & Permold Div. 29
Peerless Gear & Machinery Co. 64
Permanent Mold Die Co., Inc. 9
Precision Castings Co. 20
Precision Piston Rings, Inc. 72
Procunier Safety Chuck Co. 64
Projectile & Engineering Co., Ltd., The 21

R

Reed-Prentice Corp. 18
Republic Steel Corp. 7
Rossborough Supply Co. 82

S

Speed-D-Burr Corp. 65
Spincraft, Inc. 94
Stroh Die Moulded Casting Co. 97
Stroman Furnace & Engineering Co. 73

T

Thompson Products, Inc., Light Metals Division 2
Titan Metal Mfg. Co. 23

U

Universal Die Casting Co. 48

W

Western Sealant Co. 72

Y

Yale & Towne Mfg. Co., Powdered Metal Products Division 25

HUDSON BAY

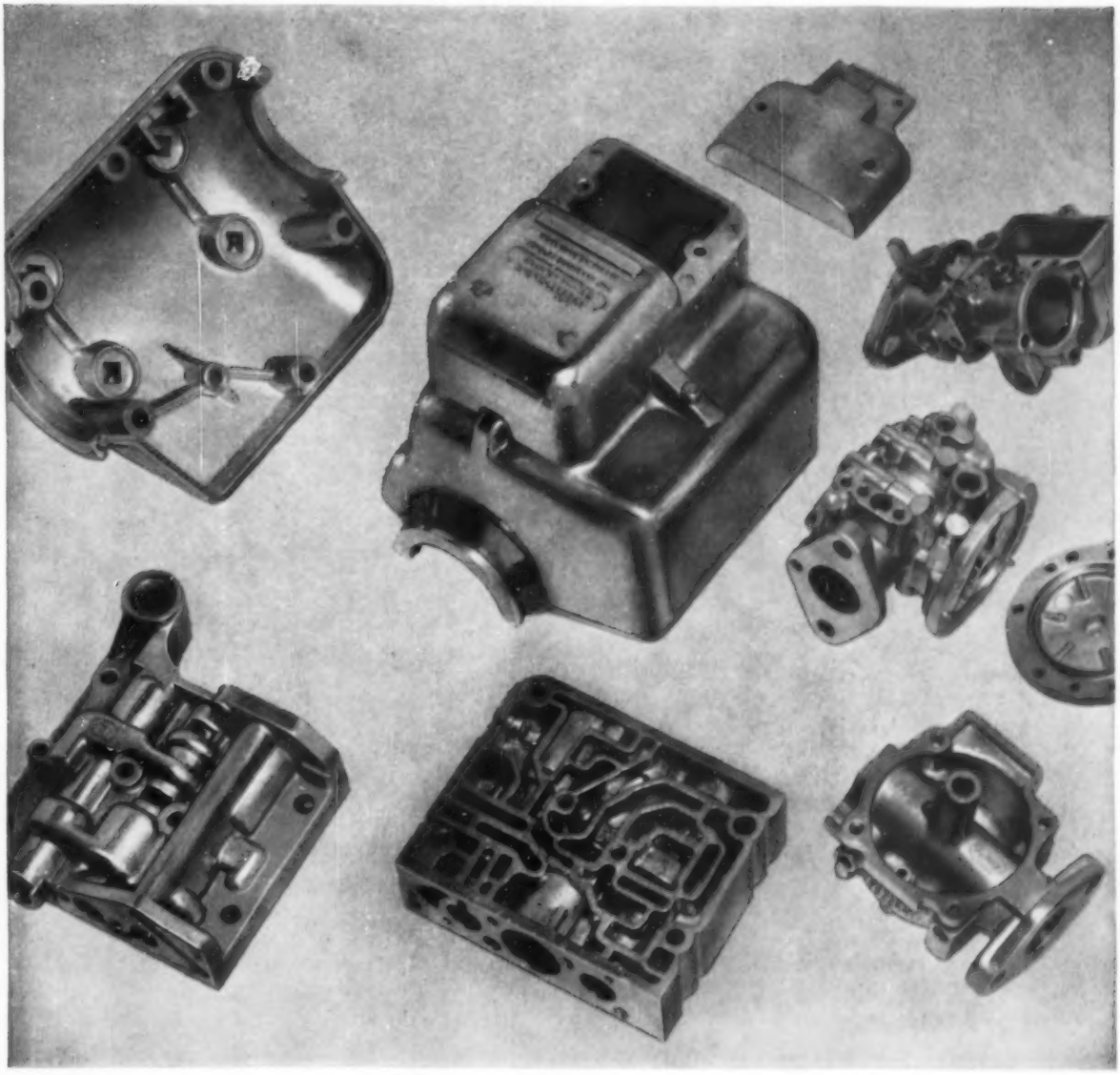
SPECIAL HIGH GRADE ZINC — 99.99%

International Minerals and Metals Corp.

11 Broadway New York 4, N.Y.

One Fine Zinc For Die Casting

For more information circle No. 37 on the Reader Service Card



Can Die Castings Like These Cut Costs For You?

Every die casting you see here is cutting somebody's costs. And every casting you see here is *better* because of Hoover's years of die-casting experience.

Since 1922, veteran Hoover design engineers, X-ray and metallurgical technicians have been constantly developing better zinc and aluminum alloys, improved die designs, and more efficient production methods. The experience and techniques developed through these years produces superior castings—at greater savings.

Hoover is now producing strong, well-designed castings, like those shown here, for Tillotson Carburetors, Alliance Tenna Rotors, Detroit Transmission Division of General Motors, Ford Motor Company, Remington Rand, West Bend Aluminum, and many other manufacturers who demand precision while they watch costs.

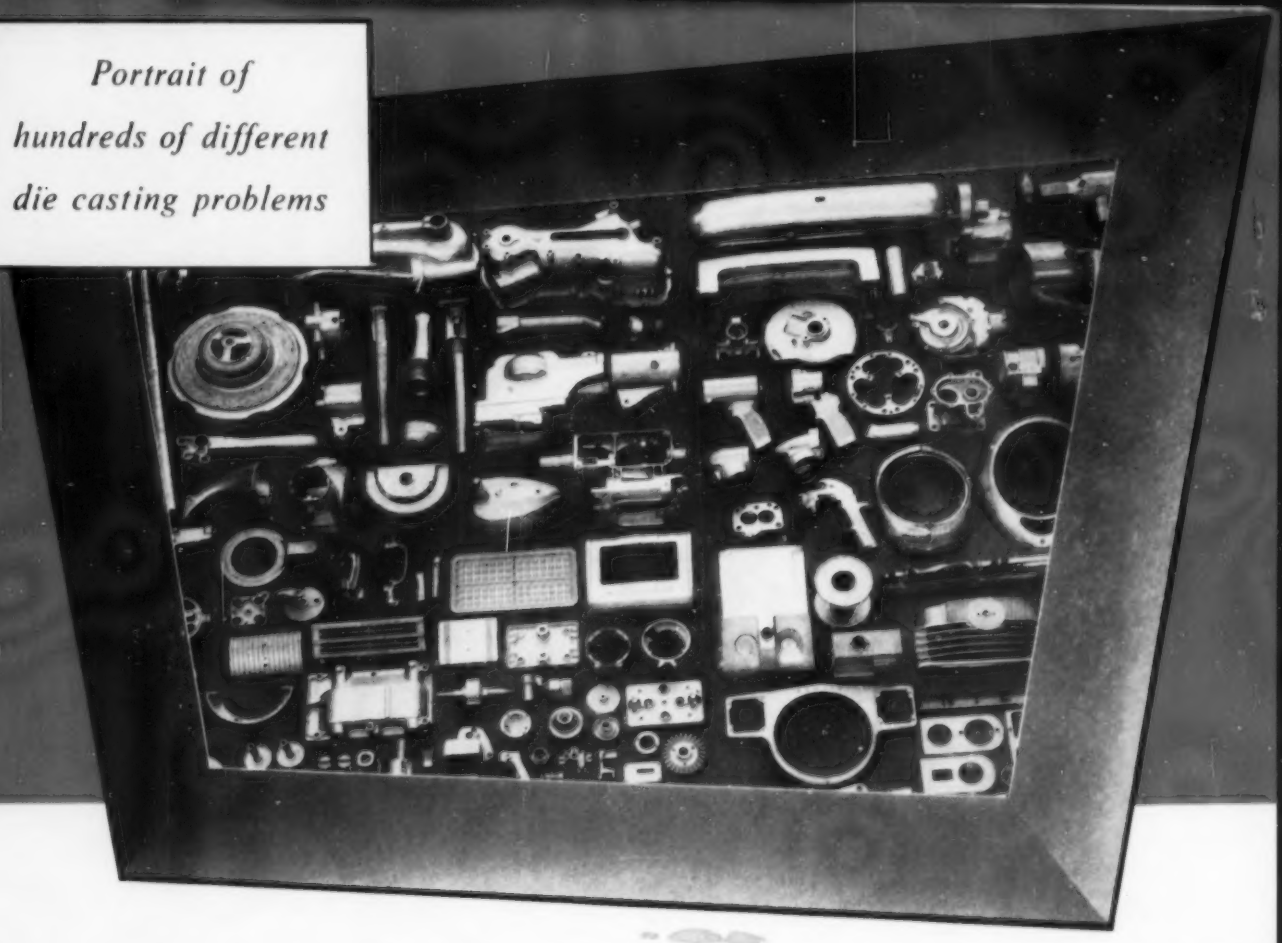
Why not write and ask to have a Hoover Sales Engineer pay you a call? Write, too, for your copy of "Hoover Die Castings," an informative booklet of THE HOOVER COMPANY, Die Castings Division, North Canton, Ohio.

HOOVER

Specialists in the field of quality die casting for over 30 years

For more information circle No. 35 on the Reader Service Card

Portrait of hundreds of different die casting problems



solved with APEX die casting ALLOYS

aluminum and zinc

Apex quality ingot is making the die caster's job easier and his production more economical in hundreds upon hundreds of applications that have varying alloy requirements. Apex produces to specification—controlling quality with rigid electronic quantometer analysis throughout the melting and refining processes. Apex uses microscopic, macroscopic, radiographic and x-ray diffraction equipment to insure clean, gas free ingot of the proper grain size, fluidity and castability.

You can *depend* on the products and service of Apex, one of America's largest smelters and suppliers of aluminum and zinc alloys to the foundry industry. Specify Apex and know you're *right!*

For more information circle No. 7 on the Reader Service Card

RESEARCH LEADERSHIP BACK OF EVERY INGOT

Send for our helpful booklet, "Die Casting Alloys." Shows composition, properties, other data on Apex products. No obligation.

APEX SMELTING COMPANY

CHICAGO CLEVELAND LOS ANGELES